ATTACHMENT F

DATA VALIDATION REPORTS

EcoChem, INC.
Environmental Data Quality

DATA QUALITY EVALUATION

SLIP 4 EARLY ACTION AREA

Pre-construction Boundary Sediment Sampling

Prepared for:

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DATA QUALITY EVALUATION

BASIS OF DATA EVALUATION

The data were validated using guidance and quality control (QC) criteria documented in the analytical methods; *Lower Duwamish Waterway, Slip 4 Early Action Area, 100% Design Submittal Construction Quality Assurance Plan* (Integral Aug. 30, 2010); *Guidance on Environmental Data Verification and Validation* (EPA 2002); *National Functional Guidelines for Organic Data Review* (USEPA 1999 & 2005); *and National Functional Guidelines for Inorganic Data Review* (USEPA 1994 & 2004).

The samples for this sampling event were analyzed for the following:

Analysis	Method
Semivolatile Organic Compounds	SW8270D
Polychlorinated Biphenyl (PCB) Aroclors	SW8082
Metals	SW6010B, SW 7470A, SW7471A
Total Organic Carbon, Total Solids	Plumb 1981, E415.1, E160.3M

Data qualifier definitions, reason codes, and validation criteria are included as **Appendix A**. Data validation reports, which discuss individual findings for each quality control element, are provided in **Appendix B**. Data validation worksheets and communication records will be kept on file at EcoChem.

PROCESS FOR DATA VALIDATION

All electronic data deliverable files (EDD) were verified by comparing 100% of the field sample results and 10% of the QC sample results to the hardcopy data package. All (100%) of the sediment data received a full (EPA Stage 4) validation, which included evaluation (as appropriate for each method) of the items listed below. Rinsate blanks received a compliance level review (EPA Stage 2A):

- Package completeness
- Sample chain-of-custody and sample preservation
- Analytical holding times
- Blank contamination
- Precision (replicate analyses)
- Accuracy (compound recovery)
- Chromatogram review
- Detection limits and target analyte list
- Instrument performance (initial calibration, continuing calibration, tuning, sensitivity and degradation)
- Compound Identification
- Transcription checks
- Calculation checks

A dual-tier system of primary and secondary reviewers is utilized to ensure technical correctness and QC of the validation process; and all data validation is documented using standardized and controlled validation worksheets and spreadsheets. These worksheets are completed for each SDG, documenting all deficiencies, outliers and subsequent qualifiers.

After qualifiers are entered into the EcoChem database, a second party verifies 100% of the qualifier entry. Interpretive qualifiers are then applied to the field samples and qualified data is exported to the project database (Integral).

SUMMARY OF DATA VALIDATION: SEMIVOLATILE ORGANIC COMPOUNDS

A total of 9 sediment samples and 3 rinsate blanks were analyzed for semivolatile organic compounds (SVOC) for the Slip 4 Preconstruction and Confirmation Sediment Sampling. Analytical Resources, Inc., Tukwila, Washington performed the SVOC analyses.

The SVOC data for the samples were generally acceptable. No data were rejected. A total of 6 sediment data points (1.7% of all SVOC sediment results) were qualified as not-detected due to method blank contamination.

All results for the rinsate blanks were estimated as the samples were extracted after the holding time had expired. Qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during the analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the SVOC analyses.

Holding Times and Sample Preservation

The rinsate blanks were extracted after the 7 day holding time. There were no target analytes detected in the rinsate blanks; reporting limits were estimated (UJ) to indicate a potential low bias.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. The initial and continuing calibration (CCAL) analyses met all acceptance criteria, with the exception of the CCAL percent difference value for hexachlorobutadiene. No action was necessary as the outlier indicated a high bias and the analyte was not detected in the field samples.

Method Blank Analyses

Method blanks were analyzed at an appropriate frequency. Bis(2-ethylhexyl)phthalate was detected in the method blank associated with the sediment samples. Positive results for this compound that were less than the action level of 10 times the blank concentration were qualified as not detected (U).

Accuracy

Surrogate Compound Recovery

Surrogate compounds were added to all samples. The surrogate recovery values reported by the laboratory met the criteria for acceptable performance for all field samples.

Matrix Spike Recovery

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at the proper frequency. The recovery values reported by the laboratory for MS/MSD analyses met the criteria for acceptable performance.

Laboratory Control Sample Recovery

Laboratory control sample (LCS) analyses were performed at the proper frequency. For the laboratory control samples associated with the rinsate blanks, the recoveries for benzoic acid exceeded the upper control limit. This analyte was not detected in the associated samples; therefore no action was necessary based on the potential high bias.

Precision

The MS/MSD analyses were evaluated for laboratory precision. All of the relative percent difference (RPD) values for the MS/MSD analyses were acceptable.

Target Analyte List

Results were reported for all target analytes specified in the QAPP. In addition, results were also reported for 1-methylnaphthalene. No action was taken for the extra analyte.

Field Quality Control Samples

Three rinsate blanks were submitted: RB0001, RB0002, and WB0001. No target analytes were detected in the field blanks.

One set of field replicates were submitted: SD0003 and SD0004. All precision criteria were met.

SUMMARY OF DATA VALIDATION: POLYCHLORINATED BIPHENYLS (PCB)

A total of 9 sediment samples and 3 rinsate blanks were analyzed for polychlorinated biphenyl compounds (PCB Aroclors) for the Slip 4 Preconstruction and Confirmation Sediment Sampling. Analytical Resources, Inc., Tukwila, Washington performed the PCB Aroclor analyses.

The Aroclor data was generally acceptable. No data were rejected for any reason. One data point (1.6% of all Aroclor results) was qualified as not detected at an elevated reporting limit. This qualified data point may have a larger associated bias or may be less precise than unqualified data, but is usable for the intended purpose.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the quality control (QC) procedures used during the analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the PCB analyses.

Holding Times and Sample Preservation

All sample preservation and holding time criteria were met.

Instrument Performance

Calibrations

Initial and continuing calibrations were completed for all reported analytes at the proper frequency. All initial and continuing calibrations met all acceptance criteria.

Method Blank Analyses

Method blanks were analyzed at the appropriate frequency. No target analytes were detected in any method blank.

Accuracy

Surrogate Compound Recovery

Surrogate compounds were added to all samples. All surrogate recovery values were acceptable.

Matrix Spike Recovery

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at the proper frequency. All recoveries were within the acceptance limits.

Laboratory Control Sample Recovery

Laboratory control sample (LCS) analyses met the criteria for frequency of analysis. All LCS recovery values were acceptable.

Precision

The MS/MSD analyses were evaluated for laboratory precision. The relative percent difference (RPD) values reported by the laboratory met the criteria for acceptable performance.

Target Analyte List

No target analyte list was specified. The same seven Aroclors were reported for all field samples.

Compound Identification

The results from the two analytical columns were compared for agreement. All RPD values between the two columns met the acceptance criteria.

Reported Results

Due to the presence of non-target background interference, the Aroclor 1248 reporting limit in Sample SD0005 was flagged "Y" by the laboratory. The "Y" flagged result was qualified as not-detected (U) to indicate that the reported value represents an elevated detection limit.

Field Quality Control Samples

Three rinsate blanks were submitted: RB0001, RB0002, and WB0001. No target analytes were detected in the field blanks.

One set of field replicates were submitted: SD0003 and SD0004. All precision criteria were met.

SUMMARY OF DATA VALIDATION: METALS

A total of 9 sediment samples and 3 rinsate blanks were analyzed for select metals for the Slip 4 Preconstruction and Confirmation Sediment Sampling. Analytical Resources, Inc., Tukwila, Washington performed the metals analyses. The following metals were reported: arsenic, cadmium, chromium, copper, lead, mercury, silver, and zinc.

The metals data were generally acceptable. No data were rejected for any reason. A total of 20 data points (25% of all metals results) were estimated due to laboratory accuracy and precision outliers. This qualified data may have a larger associated bias or may be less precise than unqualified data, but is usable for the intended purpose.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for these sediment metals analyses.

Holding Times and Sample Preservation

All preservation and holding time criteria were met.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. The calibrations met all acceptance criteria.

Laboratory Blank Analyses

Method and instrument blanks were analyzed at the appropriate frequency. No target analytes were detected in the method and/or instrument blanks.

Accuracy

The accuracy of the analytical results is evaluated in the following sections in terms of analytical bias: matrix spike (MS), laboratory control sample (LCS), contract required detection limit (CRDL) standard, and interference check sample (ICS) recoveries.

Matrix Spike Recovery

The MS analyses met the criteria for frequency of analysis. The recovery values reported by the laboratory met the criteria for acceptable performance.

Laboratory Control Sample Recovery

The LCS analyses met the criteria for frequency of analysis. The recovery values reported by the laboratory met the criteria for acceptable performance, with the exception of zinc in the LCS associated with the sediments. The zinc results in all sediment samples were estimated (J) to indicate a potential high bias.

Contract Required Detection Limit Standard Analyses

CRDL standards were analyzed at the beginning of each analytical sequence. The recovery values reported by the laboratory met the criteria for acceptable performance, with one exception. For the CRDL standard associated with the rinsate blanks, the recovery of copper was greater than the upper control limit. Copper was not detected in the rinsate blanks; therefore no data were qualified based on the potential high bias.

Interference Check Samples

ICP interference check samples (ICS) were analyzed at the beginning of each analytical sequence. ICS results were within the acceptance criteria.

Precision

Laboratory duplicate analyses were evaluated for laboratory precision. The relative percent difference (RPD) values reported by the laboratory met the criteria for acceptable performance, with the exception of mercury. All mercury results in the sediment samples were estimated (J) due to the precision outlier.

Field Quality Control Samples

Three rinsate blanks were submitted: RB0001, RB0002, and WB0001. No target analytes were detected in the field blanks.

One set of field replicates were submitted: SD0003 and SD0004. All precision criteria were met.

SUMMARY OF DATA VALIDATION: TOTAL ORGANIC CARBON (TOC) AND TOTAL SOLIDS

A total of 9 sediment samples were analyzed for TOC and total solids for the Slip 4 Preconstruction and Confirmation Sediment Sampling. Three rinsate blanks were also analyzed for TOC. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington.

The TOC and total solids data for the samples were acceptable. No data were rejected or qualified for any reason.

The laboratory data were evaluated in terms of completeness, holding times, accuracy, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the conventional parameters analyses.

Holding Times and Sample Preservation

All sample preservation and holding time criteria were met.

Accuracy

Matrix Spike Recovery

The matrix spike (MS) analysis for TOC met the criteria for frequency of analysis. The recovery reported by the laboratory met the criteria for acceptable performance.

Laboratory Control Sample Recovery

The LCS analysis for TOC met the criteria for frequency of analysis. The recovery value reported by the laboratory met the criteria for acceptable performance.

Precision

Laboratory replicate analyses (duplicate and triplicate) were evaluated for laboratory precision. Precision was acceptable in all laboratory replicate analyses.

Field Quality Control Samples

Three rinsate blanks were submitted: RB0001, RB0002, and WB0001. No target analytes were detected in the field blanks.

One set of field replicates were submitted: SD0003 and SD0004. All precision criteria were met.

SAMPLE INDEX
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Sample ID	Lab ID	SVOC	PCB	METALS	CONV
RB0001	11-19832-TL93A	√			
RB0002	11-19833-TL93B	√			
WB0001	11-19834-TL93C	√			
RB0001	11-18328-TJ70J		√	√	√
RB0002	11-18329-TJ70K		√	√	√
WB0001	11-18330-TJ70L		√	√	√
SD0001	11-18319-TJ70A	√	√	√	√
SD0002	11-18320-TJ70B	√	√	√	√
SD0003	11-18321-TJ70C	√	√	√	√
SD0004	11-18322-TJ70D	√	√	√	√
SD0005	11-18323-TJ70E	√	√	√	√
SD0006	11-18324-TJ70F	√	√	√	√
SD0007	11-18325-TJ70G	√	√	√	√
SD0008	11-18326-TJ70H	√	√	√	√
SD0009	11-18327-TJ70I	√	√	√	√

QUALIFIED DATA SUMMARY TABLE
Slip 4 Pre-construction Boundary Sediment Sampling

Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier	DV Reason Code
SD0001	11-18319-TJ70A	SW6010B	Zinc	126	mg/kg		J	10
SD0002	11-18320-TJ70B	SW6010B	Zinc	150	mg/kg		J	10
SD0003	11-18321-TJ70C	SW6010B	Zinc	128	mg/kg		J	10
SD0003	11-18321-TJ70CLR	SW6010B	Zinc	129	mg/kg		J	10
SD0004	11-18322-TJ70D	SW6010B	Zinc	135	mg/kg		J	10
SD0005	11-18323-TJ70E	SW6010B	Zinc	215	mg/kg		J	10
SD0006	11-18324-TJ70F	SW6010B	Zinc	131	mg/kg		J	10
SD0007	11-18325-TJ70G	SW6010B	Zinc	132	mg/kg		J	10
SD0008	11-18326-TJ70H	SW6010B	Zinc	128	mg/kg		J	10
SD0009	11-18327-TJ70I	SW6010B	Zinc	116	mg/kg		J	10
SD0001	11-18319-TJ70A	SW7471A	Mercury	0.16	mg/kg		J	9
SD0002	11-18320-TJ70B	SW7471A	Mercury	0.17	mg/kg		J	9
SD0003	11-18321-TJ70C	SW7471A	Mercury	0.31	mg/kg		J	9
SD0003	11-18321-TJ70CLR	SW6010B	Mercury	0.20	mg/kg		J	9
SD0004	11-18322-TJ70D	SW7471A	Mercury	0.16	mg/kg		J	9
SD0005	11-18323-TJ70E	SW7471A	Mercury	0.13	mg/kg		J	9
SD0006	11-18324-TJ70F	SW7471A	Mercury	0.17	mg/kg		J	9
SD0007	11-18325-TJ70G	SW7471A	Mercury	0.17	mg/kg		J	9
SD0008	11-18326-TJ70H	SW7471A	Mercury	0.16	mg/kg		J	9
SD0009	11-18327-TJ70I	SW7471A	Mercury	0.15	mg/kg		J	9
SD0005	11-18323-TJ70E	SW8082	Aroclor 1248		ug/kg	Y	U	22
RB0001	11-19832-TL93A	SW8270D	1,2,4-Trichlorobenzene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	1,2-Dichlorobenzene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	1,3-Dichlorobenzene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	1,4-Dichlorobenzene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	1-Methylnaphthalene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	2,4-Dimethylphenol		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	2-Methylnaphthalene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	2-Methylphenol		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	4-Methylphenol		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Acenaphthene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Acenaphthylene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Anthracene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Benzo(a)anthracene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Benzo(a)pyrene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Benzo(g,h,i)perylene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Benzoic Acid		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Benzyl Alcohol		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	bis(2-Ethylhexyl)phthalate		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Butylbenzylphthalate		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Chrysene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Dibenz(a,h)anthracene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Dibenzofuran		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Diethylphthalate		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Dimethylphthalate		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Di-n-Butylphthalate		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Di-n-Octyl phthalate		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Fluoranthene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Fluorene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Hexachlorobenzene		ug/l	U	UJ	1

QUALIFIED DATA SUMMARY TABLE
Slip 4 Pre-construction Boundary Sediment Sampling

Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier	DV Reason Code
RB0001	11-19832-TL93A	SW8270D	Hexachlorobutadiene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Hexachloroethane		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Indeno(1,2,3-cd)pyrene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Naphthalene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	N-Nitrosodiphenylamine		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Pentachlorophenol		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Phenanthrene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Phenol		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Pyrene		ug/l	U	UJ	1
RB0001	11-19832-TL93A	SW8270D	Total Benzofluoranthenes		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	1,2,4-Trichlorobenzene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	1,2-Dichlorobenzene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	1,3-Dichlorobenzene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	1,4-Dichlorobenzene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	1-Methylnaphthalene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	2,4-Dimethylphenol		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	2-Methylnaphthalene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	2-Methylphenol		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	4-Methylphenol		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Acenaphthene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Acenaphthylene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Anthracene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Benzo(a)anthracene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Benzo(a)pyrene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Benzo(g,h,i)perylene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Benzoic Acid		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Benzyl Alcohol		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	bis(2-Ethylhexyl)phthalate		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Butylbenzylphthalate		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Chrysene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Dibenz(a,h)anthracene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Dibenzofuran		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Diethylphthalate		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Dimethylphthalate		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Di-n-Butylphthalate		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Di-n-Octyl phthalate		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Fluoranthene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Fluorene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Hexachlorobenzene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Hexachlorobutadiene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Hexachloroethane		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Indeno(1,2,3-cd)pyrene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Naphthalene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	N-Nitrosodiphenylamine		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Pentachlorophenol		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Phenanthrene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Phenol		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Pyrene		ug/l	U	UJ	1
RB0002	11-19833-TL93B	SW8270D	Total Benzofluoranthenes		ug/l	U	UJ	1
SD0001	11-18319-TJ70A	SW8270D	bis(2-Ethylhexyl)phthalate	57	ug/kg	B	U	7

QUALIFIED DATA SUMMARY TABLE
Slip 4 Pre-construction Boundary Sediment Sampling

Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier	DV Reason Code
SD0002	11-18320-TJ70B	SW8270D	bis(2-Ethylhexyl)phthalate	140	ug/kg	B	U	7
SD0003	11-18321-TJ70C	SW8270D	bis(2-Ethylhexyl)phthalate	97	ug/kg	B	U	7
SD0004	11-18322-TJ70D	SW8270D	bis(2-Ethylhexyl)phthalate	120	ug/kg	B	U	7
SD0005	11-18323-TJ70E	SW8270D	bis(2-Ethylhexyl)phthalate	160	ug/kg	B	U	7
SD0007	11-18325-TJ70G	SW8270D	bis(2-Ethylhexyl)phthalate	84	ug/kg	B	U	7
WB0001	11-19834-TL93C	SW8270D	1,2,4-Trichlorobenzene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	1,2-Dichlorobenzene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	1,3-Dichlorobenzene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	1,4-Dichlorobenzene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	1-Methylnaphthalene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	2,4-Dimethylphenol		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	2-Methylnaphthalene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	2-Methylphenol		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	4-Methylphenol		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Acenaphthene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Acenaphthylene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Anthracene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Benzo(a)anthracene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Benzo(a)pyrene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Benzo(g,h,i)perylene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Benzoic Acid		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Benzyl Alcohol		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	bis(2-Ethylhexyl)phthalate		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Butylbenzylphthalate		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Chrysene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Dibenz(a,h)anthracene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Dibenzofuran		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Diethylphthalate		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Dimethylphthalate		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Di-n-Butylphthalate		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Di-n-Octyl phthalate		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Fluoranthene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Fluorene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Hexachlorobenzene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Hexachlorobutadiene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Hexachloroethane		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Indeno(1,2,3-cd)pyrene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Naphthalene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	N-Nitrosodiphenylamine		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Pentachlorophenol		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Phenanthrene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Phenol		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Pyrene		ug/l	U	UJ	1
WB0001	11-19834-TL93C	SW8270D	Total Benzofluoranthenes		ug/l	U	UJ	1

EcoChem, INC.
Environmental Data Quality

APPENDIX A
DATA QUALIFIER DEFINITIONS REASON CODES AND CRITERIA TABLES

DATA VALIDATION QUALIFIER CODES
Based on National Functional Guidelines

The following definitions provide brief explanations of the qualifiers assigned to results in the data review process.

U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents the approximate concentration.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

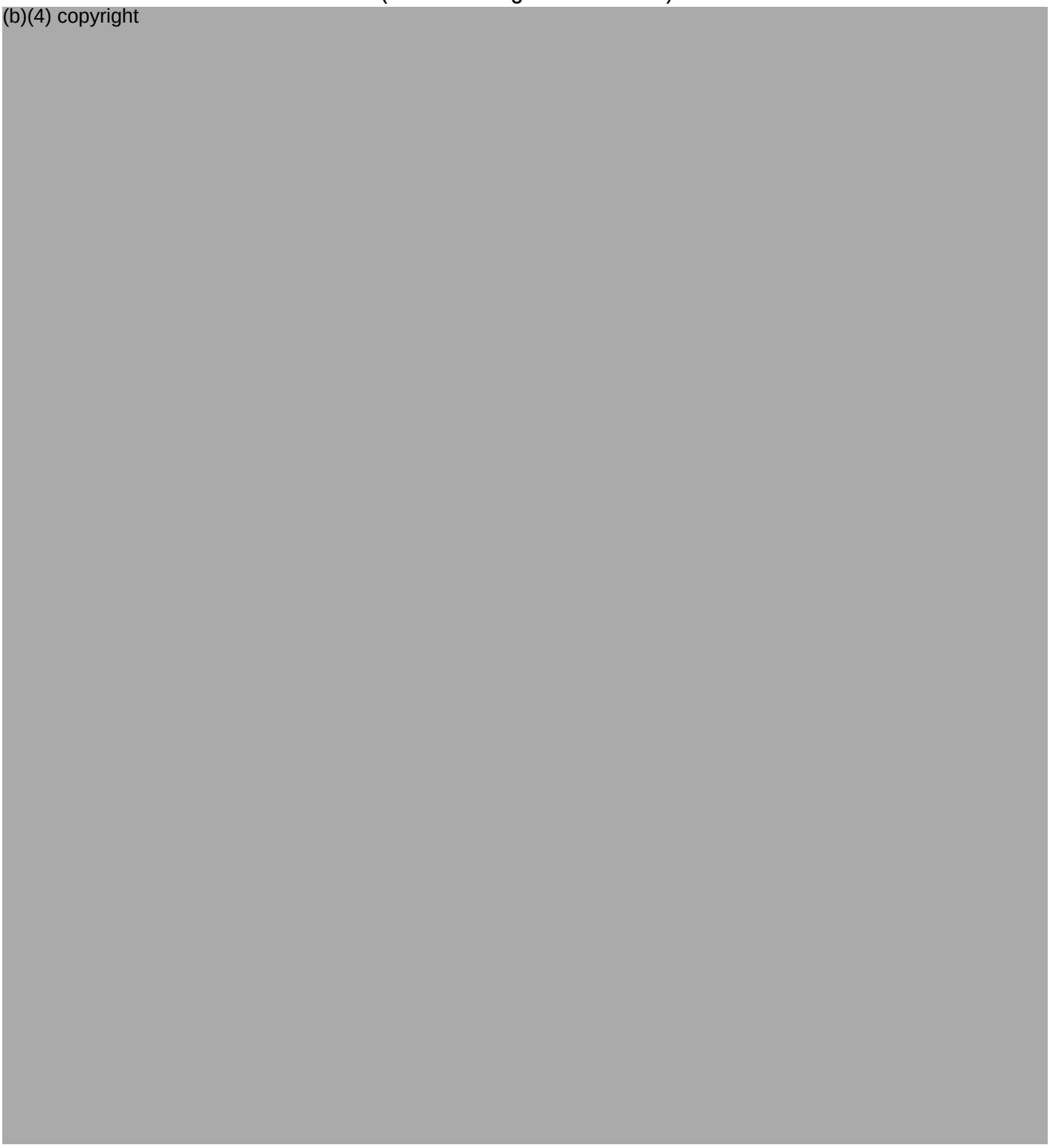
The following is an EcoChem qualifier that may also be assigned during the data review process:

DNR	Do not report; a more appropriate result is reported from another analysis or dilution.

DATA QUALIFIER REASON CODES

1	Holding Time/Sample Preservation
2	Chromatographic pattern in sample does not match pattern of calibration standard.
3	Compound Confirmation
4	Tentatively Identified Compound (TIC) (associated with NJ only)
5A	Calibration (initial)
5B	Calibration (continuing)
6	Field Blank Contamination
7	Lab Blank Contamination (e.g., method blank, instrument, etc.)
8	Matrix Spike(MS & MSD) Recoveries
9	Precision (all replicates)
10	Laboratory Control Sample Recoveries
11	A more appropriate result is reported (associated with “R” and “DNR” only)
12	Reference Material
13	Surrogate Spike Recoveries (a.k.a., labeled compounds & recovery standards)
14	Other (define in validation report)
15	GFAA Post Digestion Spike Recoveries
16	ICP Serial Dilution % Difference
17	ICP Interference Check Standard Recovery
18	Trip Blank Contamination
19	Internal Standard Performance (e.g., area, retention time, recovery)
20	Linear Range Exceeded
21	Potential False Positives
22	Elevated Detection Limit Due to Interference (i.e., laboratory, chemical and/or matrix)

EcoChem Validation Guidelines for Semivolatile Analysis by GC/MS
(Based on Organic NFG 1999)



EcoChem Validation Guidelines for Semivolatile Analysis by GC/MS
(Based on Organic NFG 1999)

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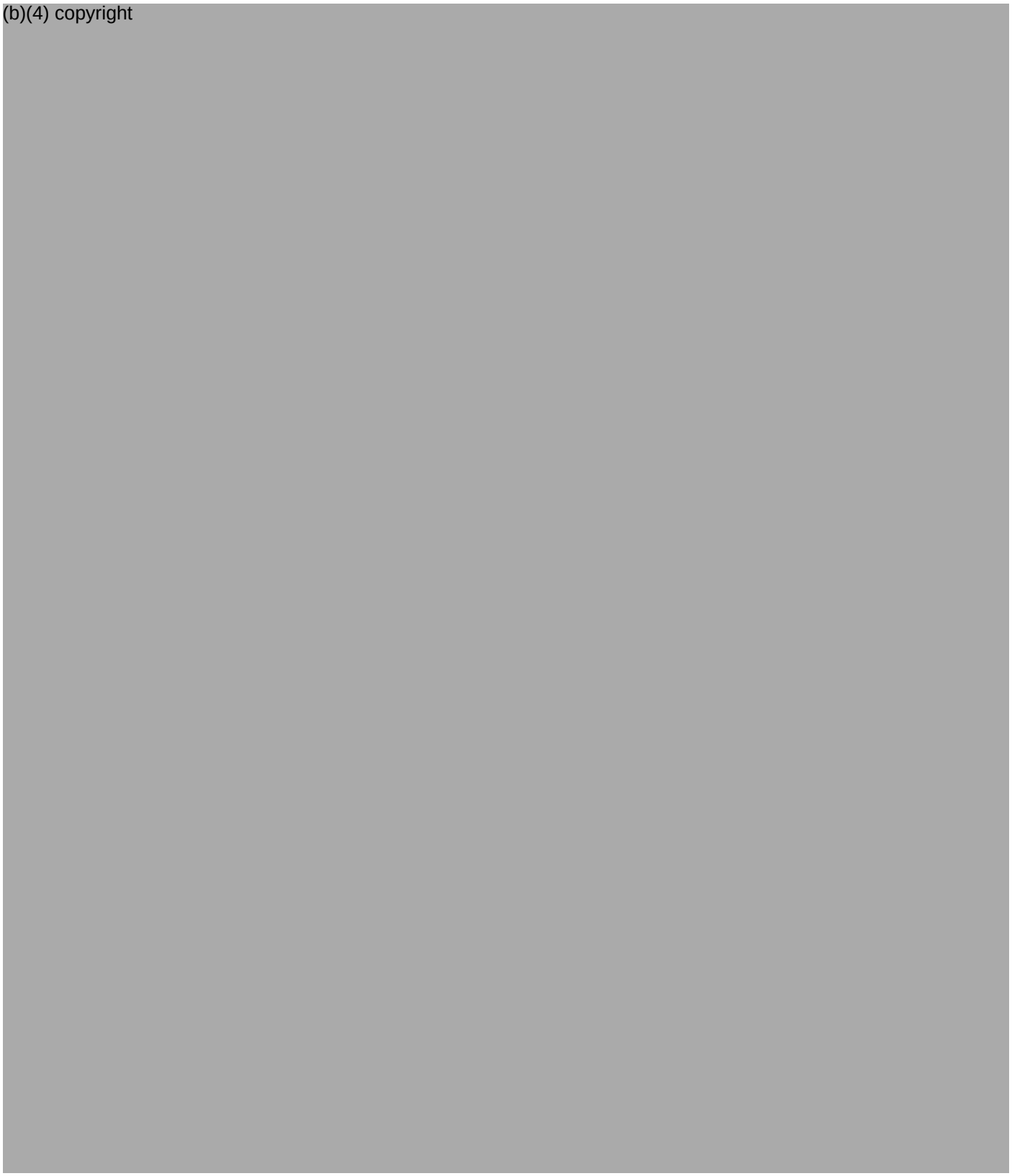
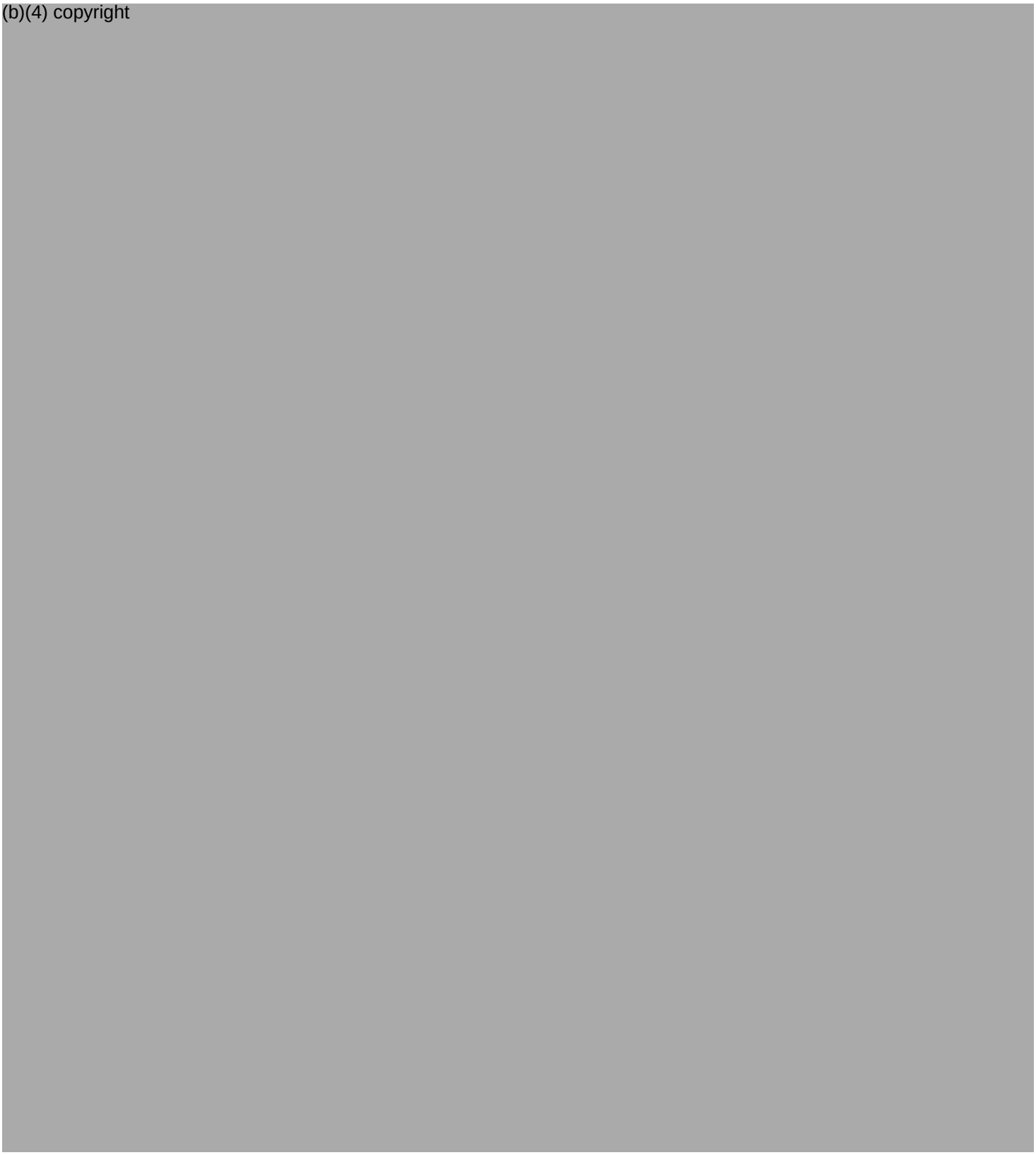
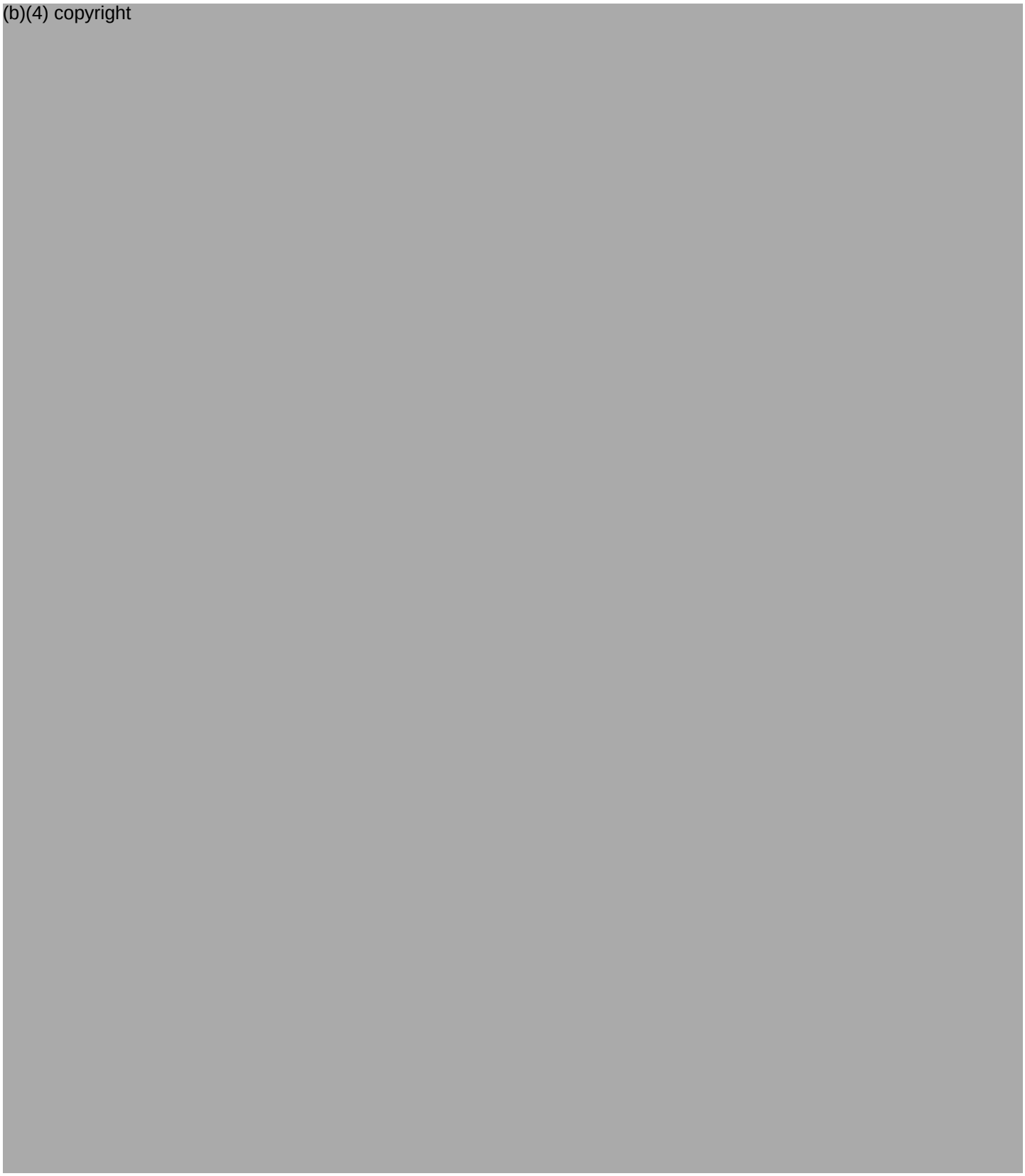


EcoChem Validation Guidelines for Pesticides, PCBs, Herbicides, and Phenol by GC/ECD
(Based on Organic NFG 1999 & EPA SW-846 Methods 8081/8082/8041/8151)

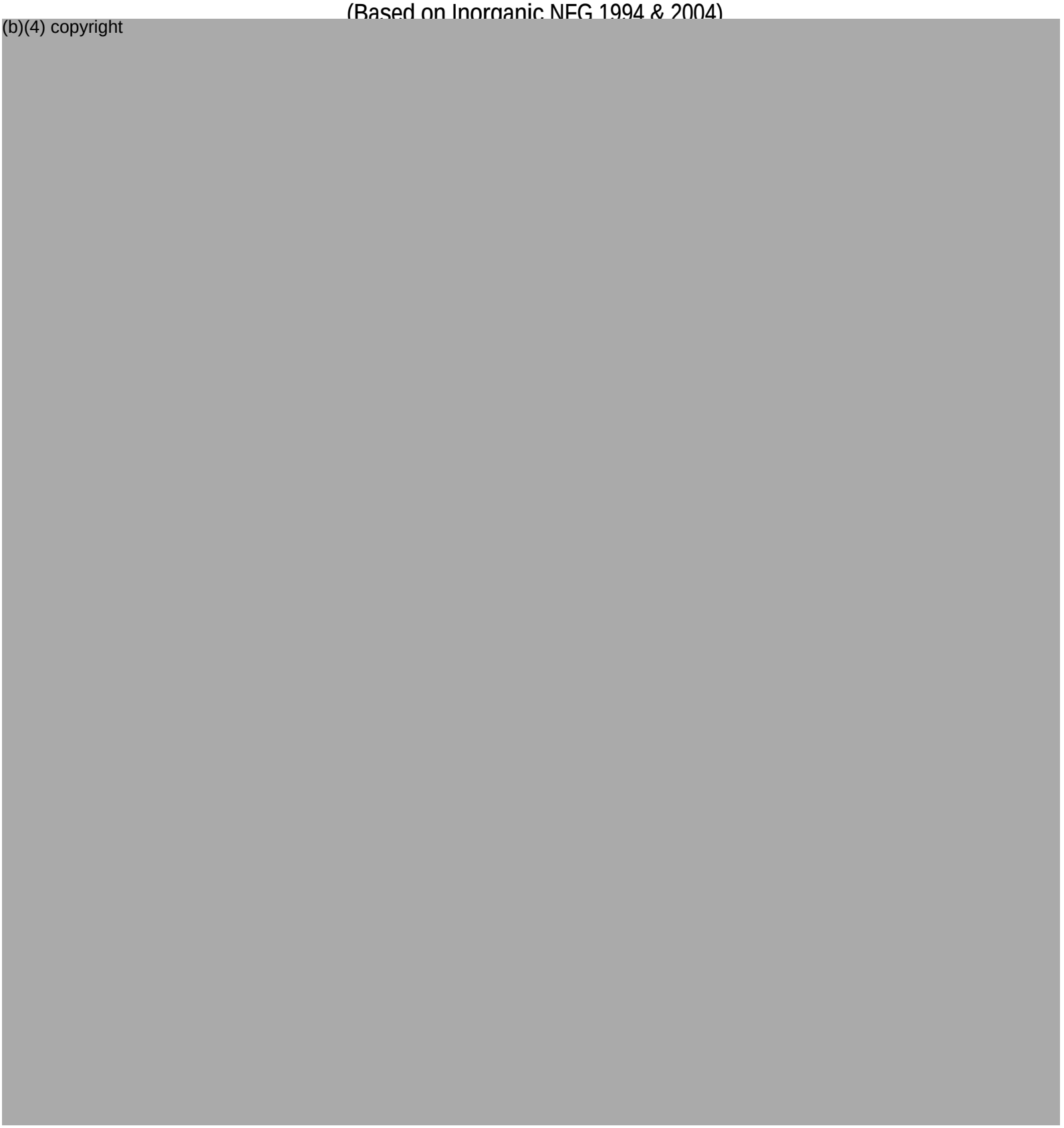


EcoChem Validation Guidelines for Pesticides, PCBs, Herbicides, and Phenol by GC/ECD
(Based on Organic NFG 1999 & EPA SW-846 Methods 8081/8082/8041/8151)



EcoChem Validation Guidelines for Metals Analysis by ICP
(Based on Inorganic NFG 1994 & 2004)

(b)(4) copyright



EcoChem Validation Guidelines for Metals Analysis by ICP
(Based on Inorganic NFG 1994 & 2004)

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(b

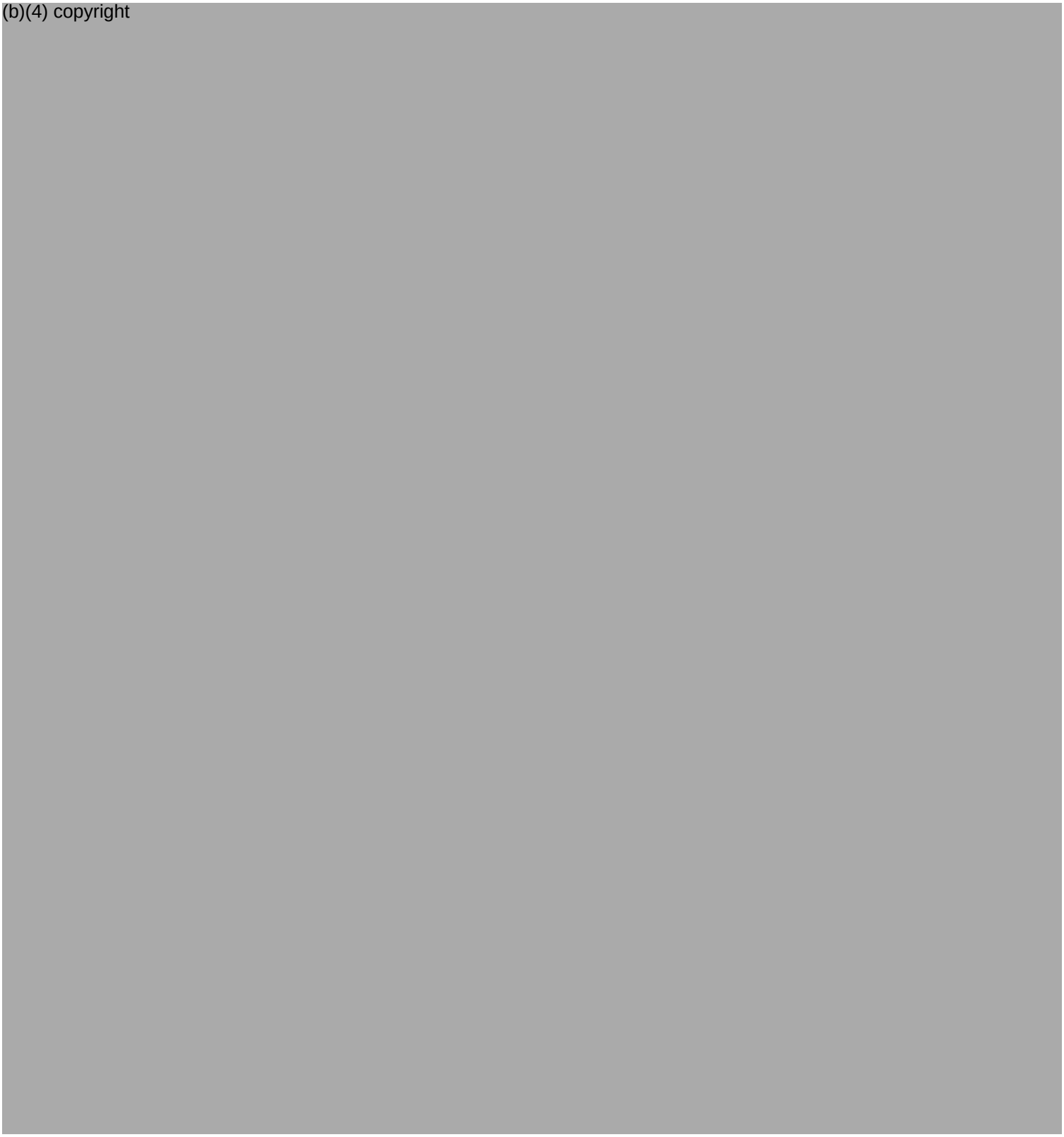
EcoChem Validation Guidelines for Metals Analysis by ICP-MS
(Based on Inorganic NFG 1994 & 2004)

EcoChem Validation Guidelines for Metals Analysis by ICP-MS
(Based on Inorganic NFG 1994 & 2004)

EcoChem Validation Guidelines for Mercury Analysis by CVAA
(Based on Inorganic NFG 1994 & 2004)

EcoChem Validation Guidelines for Mercury Analysis by CVAA
(Based on Inorganic NFG 1994 & 2004)

EcoChem Validation Guidelines for Conventional Chemistry Analysis (Based on EPA Standard Methods)



EcoChem Validation Guidelines for Conventional Chemistry Analysis (Based on EPA Standard Methods)

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EcoChem, INC.
Environmental Data Quality

APPENDIX B
DATA VALIDATION REPORTS

DATA VALIDATION REPORT
Slip 4 Pre-construction Boundary Sediment Sampling
Semivolatile Organic Compounds by Method SW8270D

This report documents the review of analytical data from the analysis of sediment samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington.

SDG	Number of Samples	Validation Level
TJ70	9 Sediment	EPA Stage 4
TL93	3 Field Blank	EPA Stage 2A

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (100%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed in the following table.

2	Sample Receipt, Preservation, and Holding Times		Laboratory Control Samples (LCS/LCSD)
	GC/MS Instrument Performance Check	1	Field Replicates
	Initial Calibration (ICAL)		Internal Standards
1	Continuing Calibration (CCAL)		Target Analyte List
2	Laboratory Blanks	1	Compound Identification
1	Field Blanks		Reported Results
1	Surrogate Compounds	1	Calculation Verification
	Matrix Spikes/Matrix Spike Duplicates (MS/MSD)		

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Sample Receipt, Preservation, and Holding Times

SDG TL93: The field blanks were extracted after the seven day holding time criterion. No target analytes were detected in the field blanks; all results were estimated (UJ-1) to indicate a potential low bias.

Continuing Calibration

SDG TJ70: The continuing calibration (CCAL) percent difference (%D) value for hexachlorobutadiene was greater than the control limit of 25% and indicated an increase in instrument response. This compound was not detected in any of the associated samples; no action was necessary based on the potential high bias.

Surrogate Compounds

SDG TL93: The 2,4,6-tribromophenol percent recovery (%R) value was greater than the upper control limit in the laboratory control sample associated with the field blanks. One outlier per acid and base/neutral fraction is allowed and qualifiers are not applied to QC samples; therefore no action was taken.

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times the concentration reported in the blank (ten times for phthalates). If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not-detected (U-7). No action is taken if the sample result is greater than the action level, or for non-detected results.

The following analytes required qualification in one or more samples based on method blank contamination:

SDG TJ70: bis(2-ethylhexyl) phthalate – 6 results

Field Blanks

SDG TL93: Two equipment rinsate blanks (RB0001 and RB0002) and one DI water blank (WB0001) were submitted. No target analytes were detected in these field blanks.

Laboratory Control Samples

SDG TL93: The relative percent difference (RPD) value for benzoic acid was greater than the control limit for the water laboratory control sample/laboratory control sample duplicate (LCS/LCSD). Benzoic acid was not detected in the associated samples; no qualifiers were required.

Field Replicates

The relative percent difference (RPD) value control limit is 50% for results greater than five times the reporting limit (RL). For results less than five times the RL, the difference between the sample and replicate must be less than two times the RL.

SDG TJ70: Samples SD0003 and SD0004 were identified as field replicates. All field precision criteria were met.

Compound Identification

SDG TJ70: The di-n-octyl phthalate results in Samples SD0006, SD0008, and SD0009 were "M" flagged by the laboratory to indicate that the analyte was detected and confirmed, but with low spectral match. The spectra were reviewed and were found to be acceptable. No qualifiers were required.

Calculation Verification

SDG TJ70: Several results were verified by recalculation from the raw data. No calculation or transcription errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. With the exceptions noted above, accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD, and MS/MSD %R values and precision was acceptable as demonstrated by the field duplicate, MS/MSD, and LCS/LCSD RPD values.

Detection limits were elevated based on method blank contamination.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Slip 4 Pre-construction Boundary Sediment Sampling
PCB Aroclors by Method SW8082

This report documents the review of analytical data from the analysis of sediment samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington.

SDG	Number of Samples	Validation Level
TJ70	9 Sediment	EPA Stage 4
	3 Field Blank	EPA Stage 2A

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (100%). No errors were found.

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed in the following table

	Sample Receipt, Preservation, and Holding Times		Matrix Spikes/Matrix Spike Duplicate (MS/MSD)
	Initial Calibration (ICAL)	1	Field Replicates
	Continuing Calibration (CCAL)		Internal Standards
	Laboratory Blanks		Reporting Limits
1	Field Blanks		Compound Identification
	Surrogate Compounds	2	Reported Results
	Laboratory Control Samples (LCS/LCSD)	1	Calculation Verification (Full Validation only)

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Field Blanks

Two equipment rinsate blanks (RB0001 and RB0002) and one DI water blank (WB0001) were submitted. No target analytes were detected in these field blanks.

Field Replicates

The relative percent difference (RPD) value control limit is 50% for results greater than five times the reporting limit (RL). For results less than five times the RL, the difference between the sample and replicate must be less than two times the RL.

Samples SD0003 and SD0004 were identified as field replicates. All field precision criteria were met.

Reporting Limits

All samples were analyzed at dilution due to matrix interference and/or high levels of Aroclors. Reporting limits were elevated accordingly.

The Aroclor 1248 result in Sample SD0005 was flagged "Y" by the laboratory due to the presence of non-target background interference. The "Y" flagged result was qualified as not-detected (U-22) to indicate that the reported value represents an elevated detection limit.

Calculation Verification

Several results were verified by recalculation from the raw data. No calculation or transcription errors were noted.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory performed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, matrix spike/matrix spike duplicate (MS/MSD), and laboratory control sample (LCS/LCSD) percent recovery values. Precision was acceptable as demonstrated by the RPD values for the MS/MSD, LCS/LCSD, and field duplicate analyses.

The Aroclor 1248 detection limit was elevated in one sample due to matrix interference.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Slip 4 Pre-construction Boundary Sediment Sampling
Metals by EPA Methods 6010B, 7470A, & 7471A

This report documents the review of analytical data from the analysis of sediment samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington.

SDG	Number of Samples	Validation Level
TJ70	9 Sediment	EPA Stage 4
	3 Field Blank	EPA Stage 2A

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (100%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

	Sample Receipt, Preservation, and Holding Times		Matrix Spikes
	Initial Calibration	2	Laboratory Duplicates
	Continuing Calibration Verification	1	Field Replicates
1	CRDL Standards		Interference Check Samples
	Laboratory Blanks		Serial Dilutions
1	Field Blanks		ICP-MS Internal Standards
2	Laboratory Control Samples (LCS)		Reporting Limits (MDL and MRL)
	Reference Materials	1	Calculation Verification

[1] ***Quality control results are discussed below, but no data were qualified***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

CRDL Standards

The laboratory analyzed reporting limit standards with concentrations equal to the reporting limits (RL) at the beginning of each analytical sequence. The recovery for copper (141.5%) was greater than the upper control limit of 130%. Associated copper results were either non-detects or present in concentrations greater than two times the reporting limits. No qualification of data was necessary.

Field Blanks

Two equipment rinsate blanks (RB0001 and RB0002) and one DI water blank (WB0001) were submitted with the sediment samples. No target analytes were detected in these field blanks.

Laboratory Control Samples

The percent recovery (%R) value for zinc was greater than the upper control limit for the laboratory control sample (LCS) associated with the sediment samples. All zinc results in the sediment samples were estimated (J-10) to indicate a potential high bias.

Laboratory Duplicates

The relative percent difference (RPD) value control limit is 35% for results greater than five times the RL. For results less than five times the RL, the difference between the sample and duplicate must be less than two times the RL.

Sample SD0003 was analyzed for laboratory duplicate analysis. Results for mercury were less than five times the RL and the difference between the sample and duplicate results was greater than two times the RL. All mercury results for the sediment samples were estimated (J-9).

Field Duplicates

The RPD value control limit is 50% for results greater than five times the RL. For results less than five times the RL, the difference between the sample and duplicate must be less than two times the RL.

Samples SD0003 and SD0004 were identified as field duplicates. Field precision was acceptable.

Calculation Verification

Several results were verified by recalculation from the raw data. No calculation or transcription errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. With the exceptions noted previously, accuracy was acceptable, as demonstrated by the matrix spike and LCS recoveries and precision was acceptable as demonstrated by the laboratory and field duplicate RPD values

Data were estimated based on an LCS recovery outlier and a laboratory duplicate RPD outlier.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Slip 4 Pre-construction Boundary Sediment Sampling
Conventional Chemistry Analyses

This report documents the review of analytical data from the analysis of sediment samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington.

SDG	Number of Samples	Validation Level
TJ70	9 Sediment	EPA Stage 4
	3 Field Blank	EPA Stage 2A

The analytical tests that were performed are summarized below.

Parameter	Method
Total Organic Carbon (TOC)	Plumb, 1981 and 415.1
Total Solids	EPA 160.3M

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (100%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed in the following table.

	Sample Receipt, Preservation, and Holding Times		Matrix Spikes (MS)
	Initial Calibration		Laboratory Replicates
	Calibration Verification	1	Field Replicates
	Laboratory Blanks		Reported Results
1	Field Blanks		Reporting Limits
	Laboratory Control Samples (LCS)	1	Calculation Verification
1	Reference Materials		

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Field Blanks

Two equipment rinsate blanks (RB0001 and RB0002) and one DI water blank (WB0001) were submitted with the sediment samples. No target analytes were detected in these field blanks.

Reference Materials

The standard reference material (SRM) ERA 053-11-05 was analyzed with the blank (water) samples for total organic carbon (TOC). The reference material NIST 1941B was analyzed with the sediment samples for TOC. All recoveries were within the certified acceptance ranges.

Field Replicates

The relative percent difference (RPD) value control limit is 50% for results greater than five times the reporting limit (RL). For results less than five times the RL, the difference between the sample and duplicate must be less than two times the RL.

Samples SD0003 and SD0004 were identified as field duplicates. Field precision was acceptable.

Calculation Verification

Several results were verified by recalculation from the raw data. No calculation or transcription errors were found.

IV. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical methods. Accuracy was acceptable as demonstrated by the matrix spike sample and laboratory control sample percent recovery values. Precision was acceptable as demonstrated by the laboratory and field replicate RPD values.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

EcoChem, INC.
Environmental Data Quality

DATA QUALITY EVALUATION

SLIP 4 EARLY ACTION AREA

Post-construction Bank Sediment Sampling

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Integral Project: A0006-14L-ECI-01

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EcoChem Project: C22129-7

January 9, 2012

Approved for Release:

Christine Ransom
Project Manager
EcoChem, Inc.

DATA QUALITY EVALUATION

BASIS OF DATA EVALUATION

The data were validated using guidance and quality control (QC) criteria documented in the analytical methods; *Lower Duwamish Waterway, Slip 4 Early Action Area, 100% Design Submittal Construction Quality Assurance Plan* (Integral Aug. 30, 2010); *Guidance on Environmental Data Verification and Validation* (EPA 2002); *National Functional Guidelines for Organic Data Review* (USEPA 1999 & 2005); *and National Functional Guidelines for Inorganic Data Review* (USEPA 1994 & 2004).

The samples for this sampling event were analyzed for the following:

Analysis	Method
Semivolatile Organic Compounds	SW8270D
Polychlorinated Biphenyl (PCB) Aroclors	SW8082
Metals	SW6010B, SW 7470A, SW7471A
Total Organic Carbon, Total Solids	Plumb 1981, E415.1, E160.3M

Data qualifier definitions, reason codes, and validation criteria are included as **Appendix A**. Data validation reports, which discuss individual findings for each quality control element, are provided in **Appendix B**. Data validation worksheets and communication records will be kept on file at EcoChem.

PROCESS FOR DATA VALIDATION

All electronic data deliverable files (EDD) were verified by comparing 100% of the field sample results and 10% of the QC sample results to the hardcopy data package. All (100%) of the sediment data received a full (EPA Stage 4) validation, which included evaluation (as appropriate for each method) of the items listed below. Rinsate blanks received a compliance level review (EPA Stage 2A):

- Package completeness
- Sample chain-of-custody and sample preservation
- Analytical holding times
- Blank contamination
- Precision (replicate analyses)
- Accuracy (compound recovery)
- Chromatogram review
- Detection limits and target analyte list
- Instrument performance (initial calibration, continuing calibration, tuning, sensitivity and degradation)
- Compound Identification
- Transcription checks
- Calculation checks

A dual-tier system of primary and secondary reviewers is utilized to ensure technical correctness and QC of the validation process; and all data validation is documented using standardized and controlled validation worksheets and spreadsheets. These worksheets are completed for each SDG, documenting all deficiencies, outliers and subsequent qualifiers.

After qualifiers are entered into the EcoChem database, a second party verifies 100% of the qualifier entry. Interpretive qualifiers are then applied to the field samples and qualified data is exported to the project database (Integral).

SUMMARY OF DATA VALIDATION: SEMIVOLATILE ORGANIC COMPOUNDS

A total of 15 sediment samples and two rinsate blanks were analyzed for semivolatile organic compounds (SVOC) for the Slip 4 Post-construction Bank Sediment Sampling. Analytical Resources, Inc., Tukwila, Washington performed the SVOC analyses.

The SVOC data for the samples were generally acceptable. No data were rejected. A total of nine results (1.5% of all SVOC sediment results) were qualified as not-detected due to method blank contamination. In addition, total of 15 results (2.6% of all SVOC sediment results) were estimated based on precision and accuracy outliers. Qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during the analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the SVOC analyses.

Holding Times and Sample Preservation

All sample preservation and holding time criteria were met.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. The initial and continuing calibration (CCAL) analyses met all acceptance criteria.

Method Blank Analyses

Method blanks were analyzed at an appropriate frequency. Bis(2-ethylhexyl)phthalate was detected in the method blank associated with the sediment samples. Positive results for this compound that were less than the action level of 10 times the blank concentration were qualified as not detected (U).

Accuracy

Surrogate Compound Recovery

Surrogate compounds were added to all samples. The surrogate recovery values reported by the laboratory met the criteria for acceptable performance for all field samples, with the exception of the

acid surrogate recoveries for Sample SD0018. The results for all acid compounds in this sample (7 results) were estimated (UJ) to indicate a potential low bias.

Matrix Spike Recovery

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at the proper frequency. A total of 4 results were estimated (J/UJ) based on MS/MSD recovery outliers.

Laboratory Control Sample Recovery

Laboratory control sample (LCS) analyses were performed at the proper frequency. For the laboratory control samples associated with the rinsate blanks, the relative percent difference (RPD) for benzoic acid exceeded the control limit. This analyte was not detected in the associated samples; therefore no action was necessary.

Precision

The MS/MSD analyses were evaluated for laboratory precision. A total of four (4) results were estimated (J) based on MS/MSD relative percent difference (RPD) outliers.

Target Analyte List

Results were reported for all target analytes specified in the QAPP. In addition, results were also reported for 1-methylnaphthalene. No action was taken for the extra analyte.

Field Quality Control Samples

Two rinsate blanks were submitted: RB0003 and WB0002. Bis(2-ethylhexyl)phthalate was detected in rinsate RB0003; however all associated sediment results were either greater than the action level or previously qualified as not detected based on method blank contamination. No action was necessary based on field blank contamination.

One set of field replicates were submitted: SD0012 and SD0013. All precision criteria were met.

SUMMARY OF DATA VALIDATION: POLYCHLORINATED BIPHENYLS (PCB)

A total of 15 sediment samples and two rinsate blanks were analyzed for polychlorinated biphenyl compounds (PCB Aroclors) for the Slip 4 Post-construction Bank Sediment Sampling. Analytical Resources, Inc., Tukwila, Washington performed the PCB Aroclor analyses.

The Aroclor data was generally acceptable. No data were rejected for any reason. A total of 13 data points (12.4% of all PCB sediment results) were qualified as not detected at an elevated reporting limit. In addition, one result for Aroclor 1260 (0.95% of all PCB sediment results) was estimated based on MS/MSD recovery outliers. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the quality control (QC) procedures used during the analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the PCB analyses.

Holding Times and Sample Preservation

All sample preservation and holding time criteria were met.

Instrument Performance

Calibrations

Initial and continuing calibrations were completed for all reported analytes at the proper frequency. All initial and continuing calibrations met all acceptance criteria.

Method Blank Analyses

Method blanks were analyzed at the appropriate frequency. No target analytes were detected in any method blank.

Accuracy

Surrogate Compound Recovery

Surrogate compounds were added to all samples. The tetrachloro-m-xylene (TCMX) recoveries were greater than the upper control limit in Samples SD0019 and SD0023. The recovery values for decachlorobiphenyl were within control limits for these samples; therefore no action was taken.

Matrix Spike Recovery

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at the proper frequency. The recoveries for both spike Aroclors (1016 and 1260) were greater than the upper control limit. The result for Aroclor 1260 in the parent sample was estimated (J) based on the potential high bias. No action was necessary for the Aroclor 1016 outlier as this compound was not detected in the parent sample.

Laboratory Control Sample Recovery

Laboratory control sample (LCS) analyses met the criteria for frequency of analysis. All LCS recovery values were acceptable.

Precision

The MS/MSD analyses were evaluated for laboratory precision. The relative percent difference (RPD) values reported by the laboratory met the criteria for acceptable performance.

Target Analyte List

No target analyte list was specified. The same seven Aroclors were reported for all field samples.

Compound Identification

The results from the two analytical columns were compared for agreement. All RPD values between the two columns met the acceptance criteria.

Reported Results

Due to the presence of non-target background interferences, several results were flagged "Y" by the laboratory. These "Y" flagged results were qualified as not-detected (U) to indicate that the reported values represent elevated detection limits.

Field Quality Control Samples

Two rinsate blanks were submitted: RB0003 and WB0002. No target analytes were detected in the field blanks.

One set of field replicates were submitted: SD0012 and SD0013. All precision criteria were met.

SUMMARY OF DATA VALIDATION: METALS

A total of 15 sediment samples and two rinsate blanks were analyzed for select metals for the Slip 4 Post-construction Bank Sediment Sampling. Analytical Resources, Inc., Tukwila, Washington performed the metals analyses. The following metals were reported: arsenic, cadmium, chromium, copper, lead, mercury, silver, and zinc.

The metals data were acceptable. No data were rejected or qualified for any reason. All data are usable for the intended purpose.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for these sediment metals analyses.

Holding Times and Sample Preservation

All preservation and holding time criteria were met.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. The calibrations met all acceptance criteria.

Laboratory Blank Analyses

Method and instrument blanks were analyzed at the appropriate frequency. No target analytes were detected in the method and/or instrument blanks.

Accuracy

The accuracy of the analytical results is evaluated in the following sections in terms of analytical bias: matrix spike (MS), laboratory control sample (LCS), contract required detection limit (CRDL) standard, and interference check sample (ICS) recoveries.

Matrix Spike Recovery

The MS analyses met the criteria for frequency of analysis. The recovery values reported by the laboratory met the criteria for acceptable performance.

Laboratory Control Sample Recovery

The LCS analyses met the criteria for frequency of analysis. The recovery values reported by the laboratory met the criteria for acceptable performance.

Contract Required Detection Limit Standard Analyses

CRDL standards were analyzed at the beginning of each analytical sequence. The recovery values reported by the laboratory met the criteria for acceptable performance.

Interference Check Samples

ICP interference check samples (ICS) were analyzed at the beginning of each analytical sequence. ICS results were within the acceptance criteria.

Precision

Laboratory duplicate analyses were evaluated for laboratory precision. The relative percent difference (RPD) values reported by the laboratory met the criteria for acceptable performance.

Field Quality Control Samples

Two rinsate blanks were submitted: RB0003 and WB0002. No target analytes were detected in the field blanks.

One set of field replicates were submitted: SD0012 and SD0013. All precision criteria were met.

SUMMARY OF DATA VALIDATION: TOTAL ORGANIC CARBON (TOC) AND TOTAL SOLIDS

A total of 15 sediment samples were analyzed for TOC and total solids for the Slip 4 Post-construction Bank Sediment Sampling. Two rinsate blanks were also analyzed for TOC. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington.

The TOC and total solids data for the samples were generally acceptable. No data were rejected for any reason. All TOC results for the sediment sample were estimated based on a matrix spike recovery outlier. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

The laboratory data were evaluated in terms of completeness, holding times, accuracy, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the conventional parameters analyses.

Holding Times and Sample Preservation

All sample preservation and holding time criteria were met.

Accuracy

Matrix Spike Recovery

The matrix spike (MS) analysis for TOC met the criteria for frequency of analysis. The recovery reported by the laboratory was greater than the upper control limit. The TOC results for all sediment samples were estimated (J) based on the potential high bias.

Laboratory Control Sample Recovery

The LCS analysis for TOC met the criteria for frequency of analysis. The recovery value reported by the laboratory met the criteria for acceptable performance.

Precision

Laboratory replicate analyses (duplicate and triplicate) were evaluated for laboratory precision. Precision was acceptable in all laboratory replicate analyses.

Field Quality Control Samples

Two rinsate blanks were submitted: RB0003 and WB0002. No target analytes were detected in the field blanks.

One set of field replicates were submitted: SD0012 and SD0013. All precision criteria were met.

Sample Index
Slip 4 Post-excavation Bank Sediment Sampling

Sample ID	Laboratory ID	SVOC	PCB	METALS	TOC	TS
SD0012	11-26619-TX57A	✓	✓	✓	✓	✓
SD0013	11-26620-TX57B	✓	✓	✓	✓	✓
SD0014	11-26621-TX57C	✓	✓	✓	✓	✓
SD0015	11-26622-TX57D	✓	✓	✓	✓	✓
SD0016	11-26623-TX57E	✓	✓	✓	✓	✓
SD0017	11-26624-TX57F	✓	✓	✓	✓	✓
SD0018	11-26625-TX57G	✓	✓	✓	✓	✓
SD0019	11-26626-TX57H	✓	✓	✓	✓	✓
SD0020	11-26627-TX57I	✓	✓	✓	✓	✓
SD0021	11-26628-TX57J	✓	✓	✓	✓	✓
SD0022	11-26629-TX57K	✓	✓	✓	✓	✓
SD0023	11-26630-TX57L	✓	✓	✓	✓	✓
SD0024	11-26631-TX57M	✓	✓	✓	✓	✓
SD0011	11-26632-TX57N	✓	✓	✓	✓	✓
SD0010	11-26633-TX57O	✓	✓	✓	✓	✓
RB0003	11-26634-TX57P	✓	✓	✓	✓	
WB0002	11-26635-TX57Q	✓	✓	✓	✓	

Qualified Data Summary Table
Slip 4 Post-excavation Bank Sediment Sampling

Sample ID	Laboratory ID	Method	Analyte	Result	Units	Laboratory Qualifier	Validation Qualifier	Validation Reason
SD0012	11-26619-TX57A	Plumb,1981	Total Organic Carbon	1.74	Percent		J	8
SD0013	11-26620-TX57B	Plumb,1981	Total Organic Carbon	1.43	Percent		J	8
SD0014	11-26621-TX57C	Plumb,1981	Total Organic Carbon	0.952	Percent		J	8
SD0015	11-26622-TX57D	Plumb,1981	Total Organic Carbon	2.1	Percent		J	8
SD0015LR	11-26622-TX57DLR	Plumb,1981	Total Organic Carbon	1.96	Percent		J	8
SD0015LT	11-26622-TX57DLT	Plumb,1981	Total Organic Carbon	2.09	Percent		J	8
SD0016	11-26623-TX57E	Plumb,1981	Total Organic Carbon	2.63	Percent		J	8
SD0017	11-26624-TX57F	Plumb,1981	Total Organic Carbon	1.57	Percent		J	8
SD0018	11-26625-TX57G	Plumb,1981	Total Organic Carbon	0.361	Percent		J	8
SD0019	11-26626-TX57H	Plumb,1981	Total Organic Carbon	2.62	Percent		J	8
SD0020	11-26627-TX57I	Plumb,1981	Total Organic Carbon	3.39	Percent		J	8
SD0021	11-26628-TX57J	Plumb,1981	Total Organic Carbon	3.25	Percent		J	8
SD0022	11-26629-TX57K	Plumb,1981	Total Organic Carbon	1.32	Percent		J	8
SD0023	11-26630-TX57L	Plumb,1981	Total Organic Carbon	1.18	Percent		J	8
SD0024	11-26631-TX57M	Plumb,1981	Total Organic Carbon	0.829	Percent		J	8
SD0011	11-26632-TX57N	Plumb,1981	Total Organic Carbon	1.71	Percent		J	8
SD0010	11-26633-TX57O	Plumb,1981	Total Organic Carbon	4.86	Percent		J	8
SD0012	11-26619-TX57A	SW8082	Aroclor 1248		ug/kg	Y	U	22
SD0014	11-26621-TX57C	SW8082	Aroclor 1248		ug/kg	Y	U	22
SD0015	11-26622-TX57D	SW8082	Aroclor 1248		ug/kg	Y	U	22
SD0015	11-26622-TX57D	SW8082	Aroclor 1260	230	ug/kg		J	8
SD0016	11-26623-TX57E	SW8082	Aroclor 1248		ug/kg	Y	U	22
SD0017	11-26624-TX57F	SW8082	Aroclor 1248		ug/kg	Y	U	22
SD0018	11-26625-TX57G	SW8082	Aroclor 1232		ug/kg	Y	U	22
SD0020	11-26627-TX57I	SW8082	Aroclor 1248		ug/kg	Y	U	22
SD0021	11-26628-TX57J	SW8082	Aroclor 1248		ug/kg	Y	U	22
SD0023	11-26630-TX57L	SW8082	Aroclor 1248		ug/kg	Y	U	22
SD0024	11-26631-TX57M	SW8082	Aroclor 1254		ug/kg	Y	U	22
SD0011	11-26632-TX57N	SW8082	Aroclor 1248		ug/kg	Y	U	22
SD0011	11-26632-TX57N	SW8082	Aroclor 1260		ug/kg	Y	U	22
SD0010	11-26633-TX57O	SW8082	Aroclor 1248		ug/kg	Y	U	22
SD0012	11-26619-TX57A	SW8270D	bis(2-Ethylhexyl)phthalate	40	ug/kg	B	U	7
SD0013	11-26620-TX57B	SW8270D	bis(2-Ethylhexyl)phthalate	44	ug/kg	B	U	7
SD0014	11-26621-TX57C	SW8270D	bis(2-Ethylhexyl)phthalate	46	ug/kg	B	U	7
SD0015	11-26622-TX57D	SW8270D	Acenaphthene	870	ug/kg		J	8
SD0015	11-26622-TX57D	SW8270D	Benzo(a)anthracene	790	ug/kg		J	9
SD0015	11-26622-TX57D	SW8270D	Benzo(a)pyrene	590	ug/kg		J	9
SD0015	11-26622-TX57D	SW8270D	Benzo(g,h,i)perylene	350	ug/kg		J	8
SD0015	11-26622-TX57D	SW8270D	Benzoic Acid		ug/kg	U	UJ	8
SD0015	11-26622-TX57D	SW8270D	bis(2-Ethylhexyl)phthalate	91	ug/kg	B	U	7
SD0015	11-26622-TX57D	SW8270D	Chrysene	930	ug/kg		J	9
SD0015	11-26622-TX57D	SW8270D	Indeno(1,2,3-cd)pyrene	270	ug/kg		J	8
SD0015	11-26622-TX57D	SW8270D	Total Benzofluoranthenes	1000	ug/kg		J	9
SD0016	11-26623-TX57E	SW8270D	bis(2-Ethylhexyl)phthalate	66	ug/kg	BJ	U	7
SD0018	11-26625-TX57G	SW8270D	2,4-Dimethylphenol		ug/kg	U	UJ	13
SD0018	11-26625-TX57G	SW8270D	2-Methylphenol		ug/kg	U	UJ	13
SD0018	11-26625-TX57G	SW8270D	4-Methylphenol		ug/kg	U	UJ	13
SD0018	11-26625-TX57G	SW8270D	Benzoic Acid		ug/kg	U	UJ	13
SD0018	11-26625-TX57G	SW8270D	Benzyl Alcohol		ug/kg	U	UJ	13

Qualified Data Summary Table
Slip 4 Post-excavation Bank Sediment Sampling

Sample ID	Laboratory ID	Method	Analyte	Result	Units	Laboratory Qualifier	Validation Qualifier	Validation Reason
SD0018	11-26625-TX57G	SW8270D	bis(2-Ethylhexyl)phthalate	20	ug/kg	BJ	U	7
SD0018	11-26625-TX57G	SW8270D	Pentachlorophenol		ug/kg	U	UJ	13
SD0018	11-26625-TX57G	SW8270D	Phenol		ug/kg	U	UJ	13
SD0020	11-26627-TX57I	SW8270D	bis(2-Ethylhexyl)phthalate	64	ug/kg	BJ	U	7
SD0022	11-26629-TX57K	SW8270D	bis(2-Ethylhexyl)phthalate	17	ug/kg	BJ	U	7
SD0024	11-26631-TX57M	SW8270D	bis(2-Ethylhexyl)phthalate	24	ug/kg	B	U	7

EcoChem, INC.
Environmental Data Quality

APPENDIX A
DATA QUALIFIER DEFINITIONS, REASON CODES, AND CRITERIA TABLES

DATA VALIDATION QUALIFIER CODES
Based on National Functional Guidelines

The following definitions provide brief explanations of the qualifiers assigned to results in the data review process.

U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents the approximate concentration.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

The following is an EcoChem qualifier that may also be assigned during the data review process:

DNR	Do not report; a more appropriate result is reported from another analysis or dilution.

DATA QUALIFIER REASON CODES

1	Holding Time/Sample Preservation
2	Chromatographic pattern in sample does not match pattern of calibration standard.
3	Compound Confirmation
4	Tentatively Identified Compound (TIC) (associated with NJ only)
5A	Calibration (initial)
5B	Calibration (continuing)
6	Field Blank Contamination
7	Lab Blank Contamination (e.g., method blank, instrument, etc.)
8	Matrix Spike(MS & MSD) Recoveries
9	Precision (all replicates)
10	Laboratory Control Sample Recoveries
11	A more appropriate result is reported (associated with “R” and “DNR” only)
12	Reference Material
13	Surrogate Spike Recoveries (a.k.a., labeled compounds & recovery standards)
14	Other (define in validation report)
15	GFAA Post Digestion Spike Recoveries
16	ICP Serial Dilution % Difference
17	ICP Interference Check Standard Recovery
18	Trip Blank Contamination
19	Internal Standard Performance (e.g., area, retention time, recovery)
20	Linear Range Exceeded
21	Potential False Positives
22	Elevated Detection Limit Due to Interference (i.e., laboratory, chemical and/or matrix)

EcoChem Validation Guidelines for Semivolatile Analysis by GC/MS (Based on Organic NFG 1999)

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EcoChem Validation Guidelines for Semivolatile Analysis by GC/MS
(Based on Organic NFG 1999)

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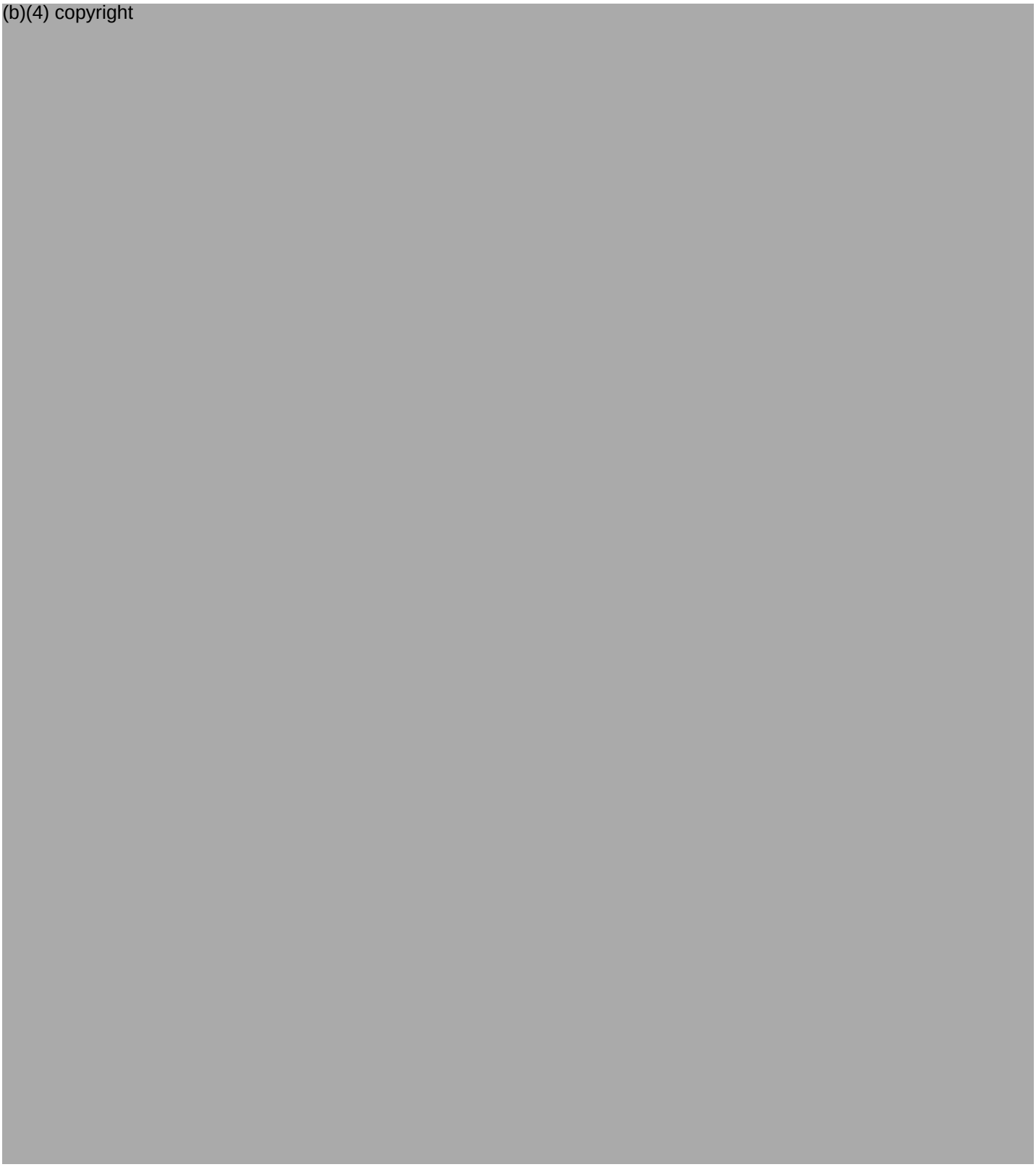
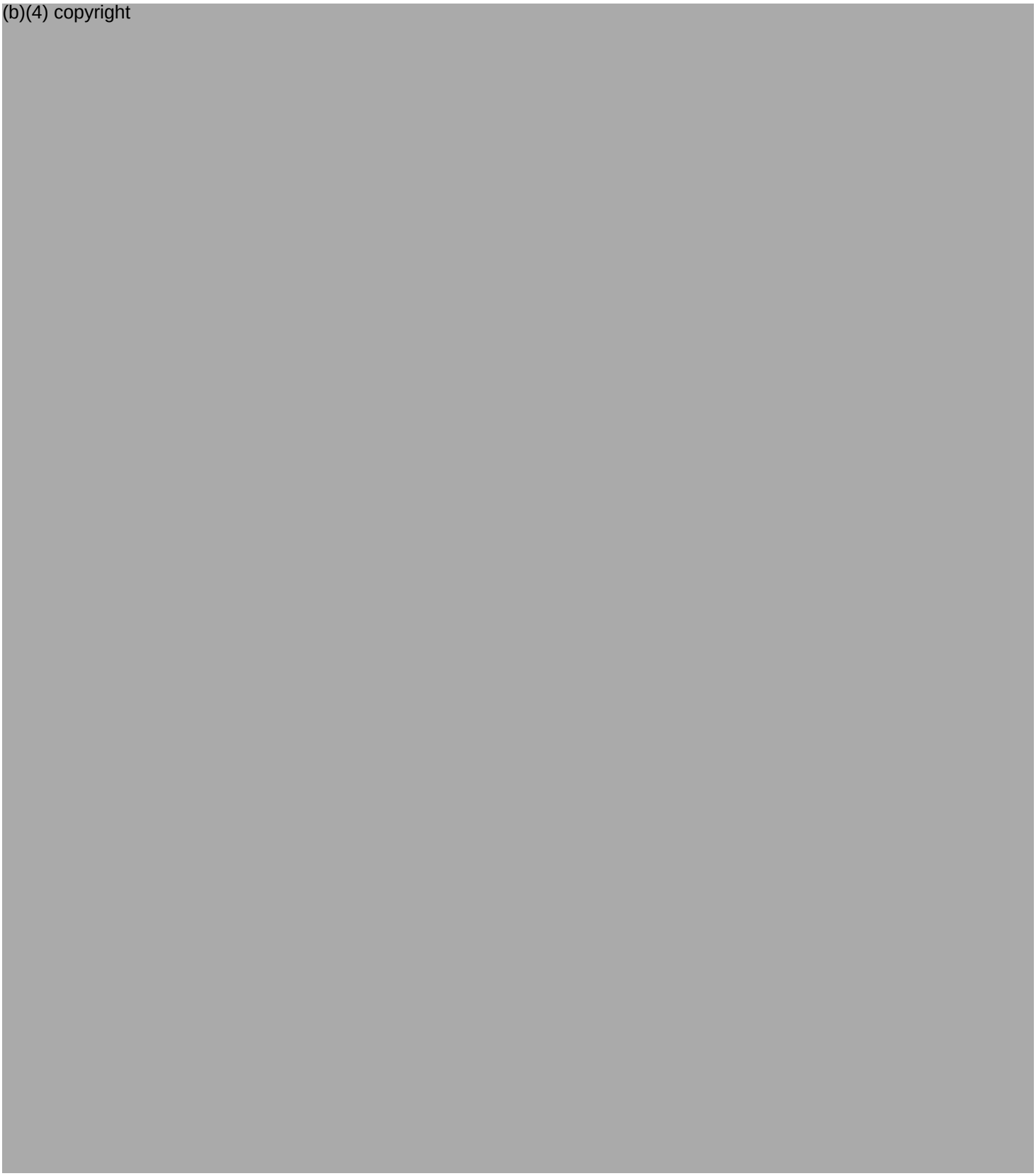
EcoChem Validation Guidelines for Pesticides, PCBs, Herbicides, and Phenol by GC/ECD (Based on Organic NFG 1999 & EPA SW-846 Methods 8081/8082/8041/8151)



EcoChem Validation Guidelines for Pesticides, PCBs, Herbicides, and Phenol by GC/ECD (Based on Organic NFG 1999 & EPA SW-846 Methods 8081/8082/8041/8151)



EcoChem Validation Guidelines for Metals Analysis by ICP
(Based on Inorganic NFG 1994 & 2004)

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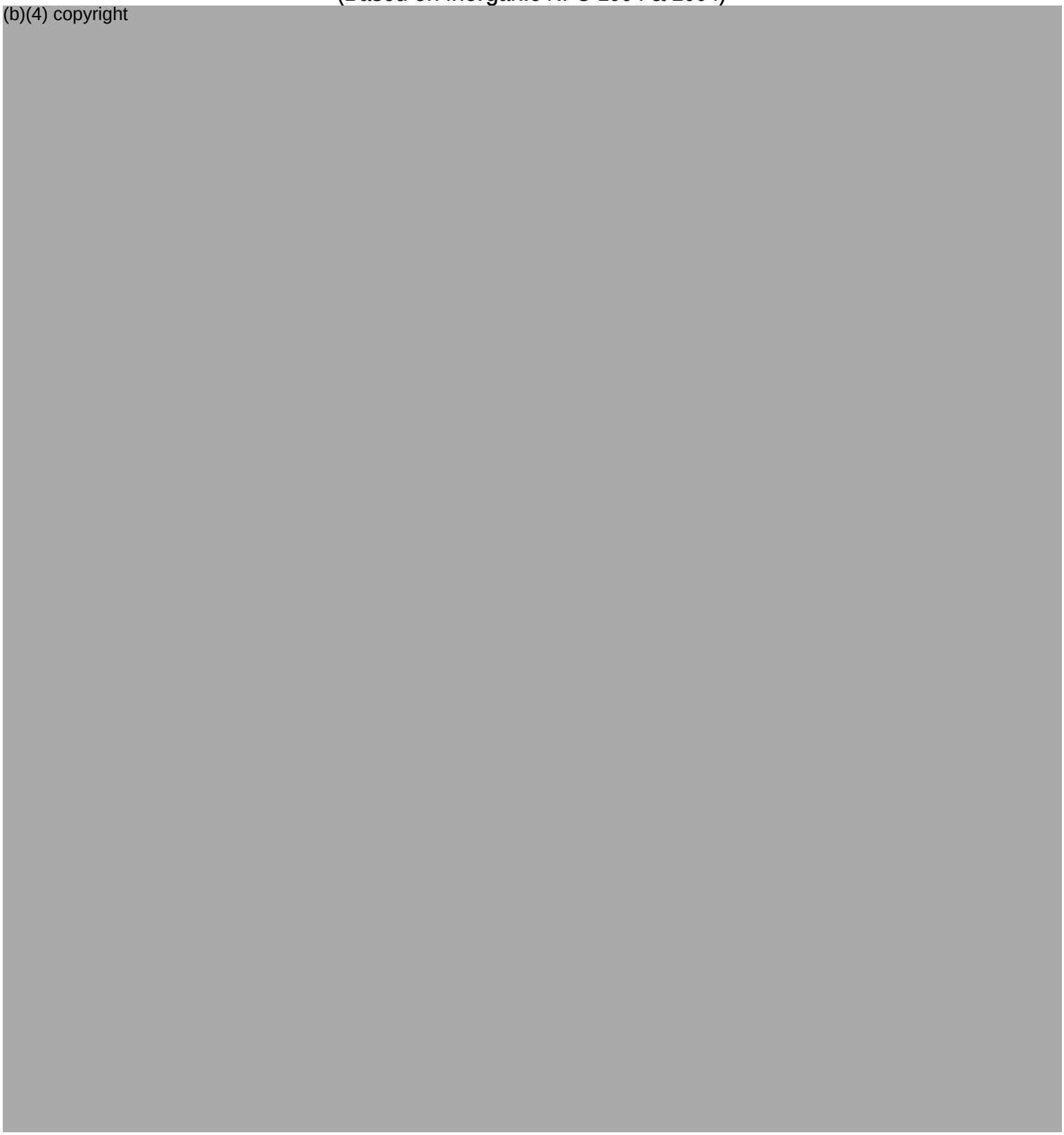

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EcoChem Validation Guidelines for Conventional Chemistry Analysis (Based on EPA Standard Methods)

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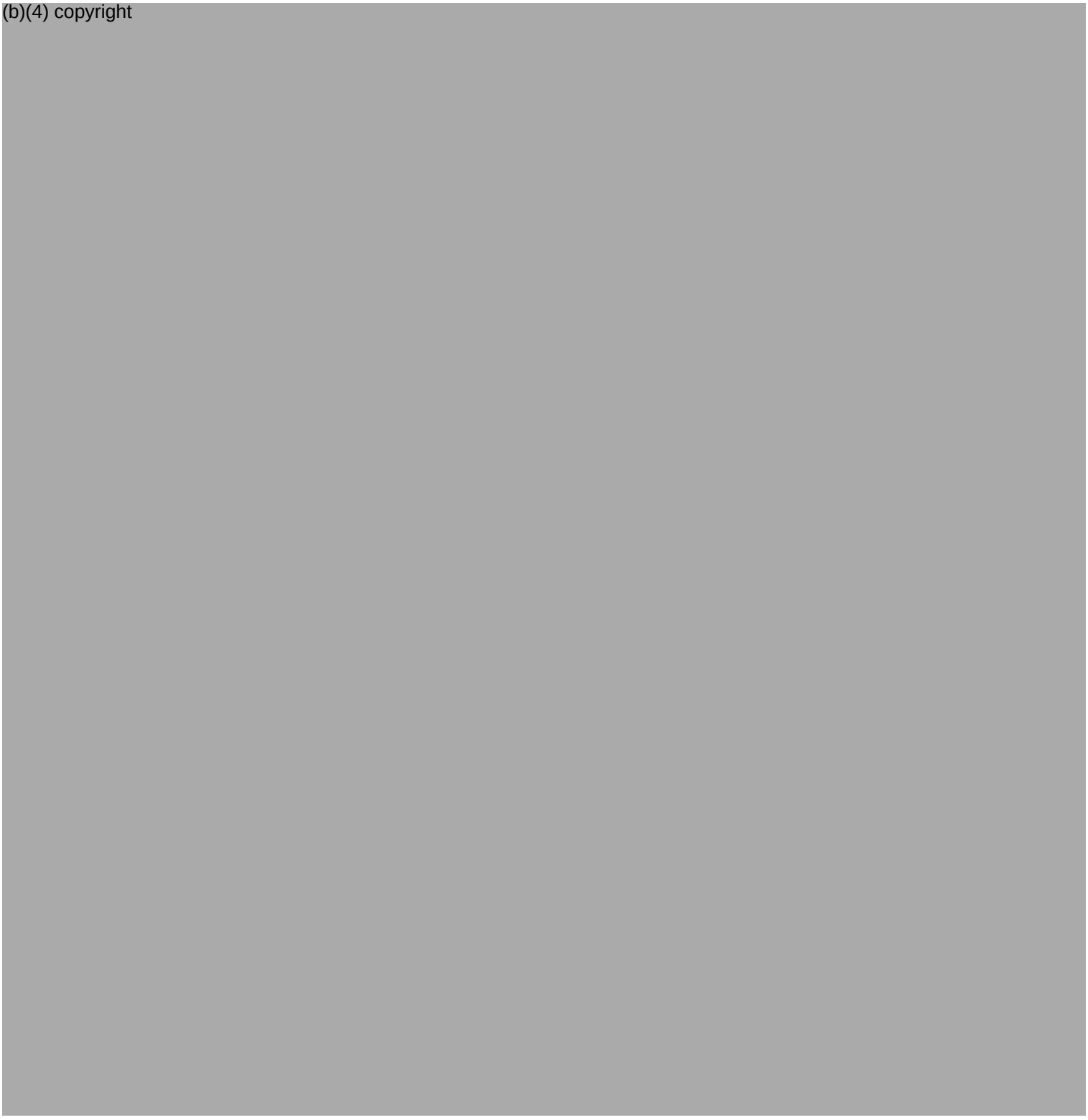

EcoChem Validation Guidelines for Conventional Chemistry Analysis (Based on EPA Standard Methods)

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Environmental Data Quality

APPENDIX B
DATA VALIDATION REPORTS

DATA VALIDATION REPORT
Slip 4 Post-excavation Bank Sediment Sampling
Semivolatile Organic Compounds by Method SW8270D

This report documents the review of analytical data from the analysis of sediment samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington.

SDG	Number of Samples	Validation Level
TX57	15 Sediment	EPA Stage 4
	2 Field Blank	EPA Stage 2A

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (100%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed in the following table.

	Sample Receipt, Preservation, and Holding Times	2	Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
	GC/MS Instrument Performance Check	1	Field Replicates
	Initial Calibration (ICAL)		Internal Standards
	Continuing Calibration (CCAL)		Target Analyte List
2	Laboratory Blanks	1	Compound Identification
1	Field Blanks		Reported Results
2	Surrogate Compounds	1	Calculation Verification (Full validation only)
1	Laboratory Control Samples (LCS/LCSD)		

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Laboratory Blanks

Bis(2-ethylhexyl)phthalate was detected in the method blank associated with the sediment samples. In order to evaluate the effect on the associated samples, an action level was established at 10 times the blank concentration as this compound is a common laboratory

contaminant. Positive results for bis(2-ethylhexyl)phthalate in the sediment samples that were less than the action level were qualified as not-detected (U-7).

Field Blanks

One equipment rinsate blanks (RB0003) and one DI water blank (WB0002) were submitted. Bis(2-ethylhexyl)phthalate was detected in rinsate blank RB0003. All results for this analyte in the sediment samples were either previously qualified as not-detected based on method blank contamination or were greater than the action level; therefore no further action was necessary.

Surrogate Compounds

The percent recovery (%R) values for the acid fraction surrogates 2-fluorophenol and 2,4,6-tribromophenol were less than the lower control limit of 30% in Sample SD0018. There were no positive results for the acid fraction analytes; reporting limits were estimated (UJ-13) to indicate a potential low bias.

Laboratory Control Samples

The relative percent difference (RPD) value for benzoic acid was greater than the control limit of 30% for the laboratory control sample/laboratory control sample duplicate (LCS/LCSD) associated with the field flanks. Benzoic acid was not detected in the associated samples; no qualifiers were required.

Matrix Spike/Matrix Spike Duplicate

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed using Sample SD0015. No action was taken where only one of the MS or MSD recoveries for a given analyte was outside of the control limits or where the native sample concentration was greater than 4 times the spiking level.

The MS/MSD %R values for benzoic acid and benzo(g,h,i)perylene were less than the lower control limits. The results for these compounds in the parent sample were estimated (J/UJ-8) to indicate a potential low bias.

The MS/MSD %R values for acenaphthene and indeno(1,2,3-cd)pyrene were greater than the upper control limits. The positive results for these analytes in the parent sample were estimated (J-8) to indicate a potential high bias.

The RPD values for di-n-butyl phthalate, benzo(a)anthracene, chrysene, benzo(a)pyrene, and total benzofluoranthenes were greater than the control limit. Positive results only for these analytes were estimated (J-9) in the parent sample.

Field Replicates

The RPD value control limit is 50% for results greater than five times the reporting limit (RL). For results less than five times the RL, the difference between the sample and replicate must be less than two times the RL.

Samples SD0012 and SD0013 were identified as field replicates. All field precision criteria were met.

Compound Identification

The N-nitrosodiphenylamine result in Sample SD0015 was "M" flagged by the laboratory to indicate that the analyte was detected and confirmed, but with low spectral match. The spectra were reviewed and were found to be acceptable. No qualifiers were required.

Calculation Verification

Several results were verified by recalculation from the raw data. No calculation or transcription errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. With the exceptions noted above, accuracy was acceptable as demonstrated by the surrogate, LCS/LCSD, and MS/MSD recoveries and precision was acceptable as demonstrated by the MS/MSD, LCS/LCSD, and field replicate RPD values.

Detection limits were elevated based on method blank contamination. Results were estimated based on surrogate %R, MS/MSD %R, and MS/MSD RPD outliers.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Slip 4 Post-excavation Bank Sediment Sampling
PCB Aroclors by Method SW8082

This report documents the review of analytical data from the analysis of sediment samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington.

SDG	Number of Samples	Validation Level
TX57	15 Sediment	EPA Stage 4
	2 Field Blank	EPA Stage 2A

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (100%). No errors were found.

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed in the following table

	Sample Receipt, Preservation, and Holding Times	2	Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
	Initial Calibration (ICAL)	1	Field Replicates
	Continuing Calibration (CCAL)		Internal Standards
	Laboratory Blanks	2	Reporting Limits
1	Field Blanks		Compound Identification
1	Surrogate Compounds		Reported Results
	Laboratory Control Samples (LCS/LCSD)	1	Calculation Verification (Full Validation only)

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Field Blanks

One equipment rinsate blank (RB0003) and one DI water blank (WB0002) were submitted. No target analytes were detected in these field blanks.

Surrogate Compounds

The percent recovery (%R) values for tetrachloro-m-xylene were greater than the upper control limit in Samples SD0019 and SD0023. The %R values for decachlorobiphenyl were within control limits for these samples. No qualifiers were required. For Samples SD0010 and SD0011, both surrogates were diluted out. No qualifies were required.

Matrix Spike/Matrix Spike Duplicate

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed using Sample SD0015. The %R values for Aroclor 1016 and Aroclor 1260 were greater than the upper control limits. The positive result for Aroclor 1260 was estimated (J-8) in the parent sample. Aroclor 1016 was not detected in the parent sample; no qualifier was required.

Field Replicates

The relative percent difference (RPD) value control limit is 50% for results greater than five times the reporting limit (RL). For results less than five times the RL, the difference between the sample and replicate must be less than two times the RL.

Samples SD0012 and SD0013 were identified as field replicates. All field precision criteria were met.

Reporting Limits

Samples SD0010 and SD0011 were analyzed at dilution due to matrix interference and/or high levels of Aroclors. Reporting limits were elevated accordingly.

Several results were flagged "Y" by the laboratory due to the presence of non-target background interferences. These "Y" flagged results were qualified as not-detected (U-22) to indicate that the reported value represents an elevated detection limit.

Calculation Verification

Several results were verified by recalculation from the raw data. No calculation or transcription errors were noted.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory performed the specified analytical method. With the exceptions noted above, accuracy was acceptable as demonstrated by the surrogate, matrix spike/matrix spike duplicate (MS/MSD), and laboratory control sample (LCS/LCSD) percent recovery values. Precision was acceptable as demonstrated by the MS/MSD, LCS/LCSD and field replicate RPD values.

Detection limits were elevated due to matrix interference. One result was estimated based on MS/MSD recovery outliers.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Slip 4 Post-excavation Bank Sediment Sampling
Metals by EPA Methods 6010B, 7470A, & 7471A

This report documents the review of analytical data from the analyses of sediment samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington.

SDG	Number of Samples	Validation Level
TX57	15 Sediment	EPA Stage 4
	2 Field Blank	EPA Stage 2A

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

	Sample Receipt, Preservation, and Holding Times		Matrix Spikes
	Initial Calibration		Laboratory Duplicates
	Continuing Calibration Verification	1	Field Replicates
	CRDL Standards		Interference Check Samples
	Laboratory Blanks		Serial Dilutions
1	Field Blanks		ICP-MS Internal Standards
	Laboratory Control Samples (LCS)		Reporting Limits (MDL and MRL)
	Reference Materials	1	Calculation Verification (Full validation only)

[1] ***Quality control results are discussed below, but no data were qualified***

Field Blanks

One equipment rinsate blank (RB0003) and one DI water blank (WB0002) were submitted. No target analytes were detected in these blanks.

Field Replicates

The relative percent difference (RPD) value control limit is 50% for results greater than five times the reporting limit (RL). For results less than five times the RL, the difference between the sample and replicate must be less than two times the RL.

Samples SD0012 and SD0013 were identified as field replicates. All field precision criteria were met.

Calculation Verification

Several results were verified by recalculation from the raw data. No calculation or transcription errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the laboratory control sample and matrix spike percent recovery (%R) values. Precision was also acceptable as demonstrated by the laboratory duplicate and field replicate RPD values.

All data, as reported, are acceptable for use.

DATA VALIDATION REPORT
Slip 4 Post-excavation Bank Sediment Sampling
Conventional Chemistry Analyses

This report documents the review of analytical data from the analysis of sediment samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington.

SDG	Number of Samples	Validation Level
TX57	15 Sediment	EPA Stage 3
	2 Field Blank	EPA Stage 2A

The analytical tests that were performed are summarized below.

Parameter	Method
Total Organic Carbon (TOC)	Plumb, 1981 and 415.1
Total Solids	EPA 160.3M

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (100%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed in the following table.

	Sample Receipt, Preservation, and Holding Times	2	Matrix Spikes (MS)
	Initial Calibration		Laboratory Replicates
	Calibration Verification	1	Field Replicates
	Laboratory Blanks		Reported Results
1	Field Blanks		Reporting Limits
	Laboratory Control Samples (LCS)	1	Calculation Verification (Full validation only)
1	Reference Materials		

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Field Blanks

One equipment rinsate blank (RB0003) and one DI water blank (WB0002) were submitted. No target analytes were detected in these blanks.

Reference Materials

The standard reference material (SRM) ERA 053-11-05 was analyzed for total organic carbon (TOC) and was associated with the field blanks. The reference material NIST 1941B was analyzed for TOC and was associated with the sediment samples. All recoveries were within the manufacturer's certified acceptance ranges.

Matrix Spikes

A matrix pike was analyzed for TOC using Sample SD0015. The percent recovery value (131%) was greater than the upper control limit of 125%. All TOC results for the sediment samples were estimated (J-8) to indicate a potential high bias.

Field Replicates

The relative percent difference (RPD) value control limit is 50% for results greater than five times the reporting limit (RL). For results less than five times the RL, the difference between the sample and replicate must be less than two times the RL.

Samples SD0012 and SD0013 were identified as field replicates. All field precision criteria were met.

Calculation Verification

Several results were verified by recalculation from the raw data. No calculation or transcription errors were found.

IV. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical methods. With the exception noted below, accuracy was acceptable as demonstrated by the matrix spike and laboratory control sample percent recovery values. Precision was acceptable as demonstrated by the laboratory and field replicate percent relative standard deviation (%RSD) and RPD values.

Results were estimated based on an MS %R outlier.

All data, as qualified, are acceptable for use.

EcoChem, INC.
Environmental Data Quality

DATA QUALITY EVALUATION

SLIP 4 EARLY ACTION AREA

Cap Confirmation and Boundary Sediment Sampling

Prepared for:

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March 15, 2012

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DATA QUALITY EVALUATION

BASIS OF DATA EVALUATION

The data were validated using guidance and quality control (QC) criteria documented in the analytical methods; *Lower Duwamish Waterway, Slip 4 Early Action Area, 100% Design Submittal Construction Quality Assurance Plan* (Integral Aug. 30, 2010); *Guidance on Environmental Data Verification and Validation* (EPA 2002); *National Functional Guidelines for Organic Data Review* (USEPA 1999 & 2005); *and National Functional Guidelines for Inorganic Data Review* (USEPA 1994 & 2004).

The samples for this sampling event were analyzed for the following:

Analysis	Method
Semivolatile Organic Compounds	SW8270D
Polychlorinated Biphenyl (PCB) Aroclors	SW8082
Metals	SW6010B, SW 7470A, SW7471A
Total Organic Carbon, Total Solids	Plumb 1981, E415.1, E160.3M

Data qualifier definitions, reason codes, and validation criteria are included as **Appendix A**. Data validation reports, which discuss individual findings for each quality control element, are provided in **Appendix B**. Data validation worksheets and communication records will be kept on file at EcoChem.

PROCESS FOR DATA VALIDATION

All electronic data deliverable files (EDD) were verified by comparing 100% of the field sample results and 10% of the QC sample results to the hardcopy data package. All (100%) of the sediment data received a full (EPA Stage 4) validation, which included evaluation (as appropriate for each method) of the items listed below. Rinsate blanks received a compliance level review (EPA Stage 2A):

- Package completeness
- Sample chain-of-custody and sample preservation
- Analytical holding times
- Blank contamination
- Precision (replicate analyses)
- Accuracy (compound recovery)
- Chromatogram review
- Detection limits and target analyte list
- Instrument performance (initial calibration, continuing calibration, tuning, sensitivity and degradation)
- Compound Identification
- Transcription checks
- Calculation checks

A dual-tier system of primary and secondary reviewers is utilized to ensure technical correctness and QC of the validation process; and all data validation is documented using standardized and controlled validation worksheets and spreadsheets. These worksheets are completed for each SDG, documenting all deficiencies, outliers and subsequent qualifiers.

After qualifiers are entered into the EcoChem database, a second party verifies 100% of the qualifier entry. Interpretive qualifiers are then applied to the field samples and qualified data is exported to the project database (Integral).

SUMMARY OF DATA VALIDATION: SEMIVOLATILE ORGANIC COMPOUNDS

A total of 24 sediment samples, two rinsate blanks, and one DI blank were analyzed for semivolatile organic compounds (SVOC) for the Slip 4 Cap Confirmation and Boundary Sediment Sampling. Analytical Resources, Inc., Tukwila, Washington performed the SVOC analyses.

The SVOC data for the samples were generally acceptable. A total of three (3) results for benzyl alcohol were rejected. A total of seven (7) results for bis(2-ethylhexyl)phthalate (0.7% of all SVOC sediment results) were qualified as not-detected due to method blank contamination. In addition, total of 39 results (4.2% of all SVOC sediment results) were estimated based on precision and accuracy outliers. Qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose. Rejected data should not be used.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during the analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 99.7% complete for the SVOC analyses.

Holding Times and Sample Preservation

All sample preservation and holding time criteria were met.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. The initial calibration analyses met all acceptance criteria.

The continuing calibration (CCAL) analyses met acceptance criteria, with the following exceptions:

The percent difference values for benzyl alcohol were outside of the 25% control limit for the CCALs associated with SDGs **UG33** and **UH04**. The outliers represented an increase in instrument response; positive results for benzyl alcohol associated with the outliers were estimated (J) to indicate a potential high bias.

Method Blank Analyses

Method blanks were analyzed at an appropriate frequency. Bis(2-ethylhexyl)phthalate was detected in the method blanks associated with the sediment samples in SDGs **UG33** and **UH04**. Positive

results for this compound that were less than the action level of 10 times the blank concentration were qualified as not detected (U).

Accuracy

Surrogate Compound Recovery

Surrogate compounds were added to all samples. The surrogate recovery values reported by the laboratory met the criteria for acceptable performance for all field samples, with the exception of the acid surrogate recoveries for Sample SD0039. The results for all acid compounds in this sample (7 results) were estimated (UJ) to indicate a potential low bias.

Matrix Spike Recovery

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at the proper frequency. Benzyl alcohol was not recovered in three of the four sets of MS/MSD analyses. The results for this compound in the parent samples were rejected (R). A total of five (5) results were estimated (J/UJ) based on MS/MSD recovery outliers.

Laboratory Control Sample Recovery

Laboratory control sample (LCS) analyses were performed at the proper frequency. A total of 21 sediment results and two (2) rinsate blank results were estimated (UJ) based on LCS recovery outliers.

Precision

The MS/MSD analyses were evaluated for laboratory precision. A total of three (3) results were estimated (J) based on MS/MSD relative percent difference (RPD) outliers.

Target Analyte List

Results were reported for all target analytes specified in the QAPP. In addition, results were also reported for 1-methylnaphthalene. No action was taken for the extra analyte.

Field Quality Control Samples

Two rinsate blanks, RB0004 and RB0005, and one DI blank, WB0003, were submitted. No target analytes were detected in these field blanks.

Two set of field replicates were submitted: SD0029 & SD0030 and SD0034 & SD0035. All precision criteria were met.

SUMMARY OF DATA VALIDATION: POLYCHLORINATED BIPHENYLS (PCB)

A total of 24 sediment samples, two rinsate blanks, and one DI blank were analyzed for polychlorinated biphenyl compounds (PCB Aroclors) for the Slip 4 Cap Confirmation and Boundary Sediment Sampling. Analytical Resources, Inc., Tukwila, Washington performed the PCB Aroclor analyses.

The Aroclor data was generally acceptable. No data were rejected for any reason. A total of three (3) data points (1.8% of all PCB sediment results) were qualified as not detected at an elevated reporting limit. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the quality control (QC) procedures used during the analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the PCB analyses.

Holding Times and Sample Preservation

All sample preservation and holding time criteria were met.

Instrument Performance

Calibrations

Initial and continuing calibrations were completed for all reported analytes at the proper frequency. All initial and continuing calibrations met all acceptance criteria.

Method Blank Analyses

Method blanks were analyzed at the appropriate frequency. No target analytes were detected in any method blank.

Accuracy

Surrogate Compound Recovery

Surrogate compounds were added to all samples. All surrogate recoveries were within the control limits.

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Matrix Spike Recovery

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at the proper frequency. The recoveries for Aroclors 1016 for the MS/MSD analyzed using Sample SD0042 were greater than the upper control limit. No action was necessary for the Aroclor 1016 outliers as this compound was not detected in the parent sample.

Laboratory Control Sample Recovery

Laboratory control sample (LCS) analyses met the criteria for frequency of analysis. All LCS recovery values were acceptable.

Precision

The MS/MSD analyses were evaluated for laboratory precision. The relative percent difference (RPD) values reported by the laboratory met the criteria for acceptable performance.

Target Analyte List

No target analyte list was specified. The same seven Aroclors were reported for all field samples.

Compound Identification

The results from the two analytical columns were compared for agreement. All RPD values between the two columns met the acceptance criteria.

Reported Results

Due to the presence of non-target background interferences, several results were flagged "Y" by the laboratory. These "Y" flagged results were qualified as not-detected (U) to indicate that the reported values represent elevated detection limits.

Field Quality Control Samples

Two rinsate blanks, RB0004 and RB0005, and one DI blank, WB0003, were submitted. No target analytes were detected in these field blanks.

Two set of field replicates were submitted: SD0029 & SD0030 and SD0034 & SD0035. All precision criteria were met.

SUMMARY OF DATA VALIDATION: METALS

A total of 24 sediment samples, two rinsate blanks, and one DI blank were analyzed for select metals for the Slip 4 Cap Confirmation and Boundary Sediment Sampling. Analytical Resources, Inc., Tukwila, Washington performed the metals analyses. The following metals were reported: arsenic, cadmium, chromium, copper, lead, mercury, silver, and zinc.

The metals data were generally acceptable. No data were rejected for any reason. A total of 16 results (8.3% of all sediment results) were estimated (J) based on accuracy outliers. All data are usable for the intended purpose. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for these sediment metals analyses.

Holding Times and Sample Preservation

All preservation and holding time criteria were met.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. The calibrations met all acceptance criteria.

Laboratory Blank Analyses

Method and instrument blanks were analyzed at the appropriate frequency. No target analytes were detected in the method and/or instrument blanks.

Accuracy

The accuracy of the analytical results is evaluated in the following sections in terms of analytical bias: matrix spike (MS), laboratory control sample (LCS), contract required detection limit (CRDL) standard, and interference check sample (ICS) recoveries.

Matrix Spike Recovery

The MS analyses met the criteria for frequency of analysis. The recovery values reported by the laboratory met the criteria for acceptable performance, with the following exceptions:

For the matrix spike associated with the samples in SDG **UH04**, the recovery for zinc was less than the lower control limit. All associated results were estimated (J) to indicate a potential low bias. The recovery for mercury was greater than the upper control limit. All associated mercury results were estimated (J) to indicate a potential high bias.

Laboratory Control Sample Recovery

The LCS analyses met the criteria for frequency of analysis. The recovery values reported by the laboratory met the criteria for acceptable performance.

Contract Required Detection Limit Standard Analyses

CRDL standards were analyzed at the beginning of each analytical sequence. The recovery values reported by the laboratory met the criteria for acceptable performance.

Interference Check Samples

ICP interference check samples (ICS) were analyzed at the beginning of each analytical sequence. ICS results were within the acceptance criteria.

Precision

Laboratory duplicate analyses were evaluated for laboratory precision. The relative percent difference (RPD) values reported by the laboratory met the criteria for acceptable performance.

Field Quality Control Samples

Two rinsate blanks, RB0004 and RB0005, and one DI blank, WB0003, were submitted. No target analytes were detected in these field blanks.

Two set of field replicates were submitted: SD0029 & SD0030 and SD0034 & SD0035. For samples SD0029 and SD0030, the RPD for chromium exceeded the control limit. All other precision criteria were met.

SUMMARY OF DATA VALIDATION: TOTAL ORGANIC CARBON (TOC) AND TOTAL SOLIDS

A total of 24 sediment samples were analyzed for TOC and total solids for the Slip 4 Cap Confirmation and Boundary Sediment Sampling. Two rinsate blanks and one DI blanks were also analyzed for TOC. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington.

The TOC and total solids data for the samples were acceptable. No data were rejected or qualified for any reason. All data are usable for the intended purpose.

The laboratory data were evaluated in terms of completeness, holding times, accuracy, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the conventional parameters analyses.

Holding Times and Sample Preservation

All sample preservation and holding time criteria were met.

Accuracy

Matrix Spike Recovery

The matrix spike (MS) analysis for TOC met the criteria for frequency of analysis and recovery.

Laboratory Control Sample Recovery

The LCS analysis for TOC met the criteria for frequency of analysis. The recovery value reported by the laboratory met the criteria for acceptable performance.

Precision

Laboratory replicate analyses (duplicate and triplicate) were evaluated for laboratory precision. Precision was acceptable in all laboratory replicate analyses.

Field Quality Control Samples

Two rinsate blanks, RB0004 and RB0005, and one DI blank, WB0003, were submitted. No target analytes were detected in these field blanks.

Two set of field replicates were submitted: SD0029 & SD0030 and SD0034 & SD0035. All precision criteria were met.

Sample Index
Slip 4 - Cap Confirmation and Boundary Sampling

Sample ID	Laboratory ID	SVOC	PCB	METALS	TOC	TS
SD0025	UG33A	✓	✓	✓	✓	✓
SD0026	UG33B	✓	✓	✓	✓	✓
SD0027	UG33C	✓	✓	✓	✓	✓
SD0028	UG33D	✓	✓	✓	✓	✓
SD0029	UG33E	✓	✓	✓	✓	✓
SD0030	UG33F	✓	✓	✓	✓	✓
SD0034	UG33G	✓	✓	✓	✓	✓
SD0035	UG33H	✓	✓	✓	✓	✓
SD0036	UG33I	✓	✓	✓	✓	✓
SD0037	UG33J	✓	✓	✓	✓	✓
SD0038	UG33K	✓	✓	✓	✓	✓
SD0039	UG33L	✓	✓	✓	✓	✓
SD0040	UG33M	✓	✓	✓	✓	✓
RB0005	UG33N	✓	✓	✓	✓	
RB0004	UG80A	✓	✓	✓	✓	
WB0003	UG80B	✓	✓	✓	✓	
SD0031	UG80C	✓	✓	✓	✓	✓
SD0032	UG80D	✓	✓	✓	✓	✓
SD0033	UG80E	✓	✓	✓	✓	✓
SD0041	UH04A	✓	✓	✓	✓	✓
SD0042	UH04B	✓	✓	✓	✓	✓
SD0043	UH04C	✓	✓	✓	✓	✓
SD0044	UH04D	✓	✓	✓	✓	✓
SD0045	UH04E	✓	✓	✓	✓	✓
SD0046	UH04F	✓	✓	✓	✓	✓
SD0047	UH04G	✓	✓	✓	✓	✓
SD0048	UH04H	✓	✓	✓	✓	✓

Qualified Data Summary Table
Slip 4 - Cap Confirmation and Boundary Sampling

Sample ID	Laboratory ID	Method	Analyte	Result	Units	Laboratory Qualifier	Validation Qualifier	Validation Reason
A00-06-14LSD0041	12-1988-UH04A	SW6010B	Zinc	159	mg/kg		J	8
A00-06-14LSD0041LR	12-1988-UH04ALR	SW6010B	Zinc	113	mg/kg		J	8
A00-06-14LSD0042	12-1989-UH04B	SW6010B	Zinc	116	mg/kg		J	8
A00-06-14LSD0043	12-1990-UH04C	SW6010B	Zinc	118	mg/kg		J	8
A00-06-14LSD0044	12-1991-UH04D	SW6010B	Zinc	112	mg/kg		J	8
A00-06-14LSD0045	12-1992-UH04E	SW6010B	Zinc	111	mg/kg		J	8
A00-06-14LSD0046	12-1993-UH04F	SW6010B	Zinc	112	mg/kg		J	8
A00-06-14LSD0047	12-1994-UH04G	SW6010B	Zinc	119	mg/kg		J	8
A00-06-14LSD0048	12-1995-UH04H	SW6010B	Zinc	84	mg/kg		J	8
A00-06-14LSD0041	12-1988-UH04A	SW7471A	Mercury	0.13	mg/kg		J	8
A00-06-14LSD0041LR	12-1988-UH04ALR	SW7471A	Mercury	0.12	mg/kg		J	8
A00-06-14LSD0042	12-1989-UH04B	SW7471A	Mercury	0.14	mg/kg		J	8
A00-06-14LSD0043	12-1990-UH04C	SW7471A	Mercury	0.15	mg/kg		J	8
A00-06-14LSD0044	12-1991-UH04D	SW7471A	Mercury	0.12	mg/kg		J	8
A00-06-14LSD0045	12-1992-UH04E	SW7471A	Mercury	0.12	mg/kg		J	8
A00-06-14LSD0046	12-1993-UH04F	SW7471A	Mercury	0.11	mg/kg		J	8
A00-06-14LSD0047	12-1994-UH04G	SW7471A	Mercury	0.12	mg/kg		J	8
A00-06-14LSD0048	12-1995-UH04H	SW7471A	Mercury	0.1	mg/kg		J	8
A00-06-14LSD0030	12-1574-UG33F	SW8082	Aroclor 1248		ug/kg	Y	U	22
A00-06-14LSD0031	12-1854-UG80C	SW8082	Aroclor 1248		ug/kg	Y	U	22
A00-06-14LSD0032	12-1855-UG80D	SW8082	Aroclor 1248		ug/kg	Y	U	22
A00-06-14LSD0025	12-1569-UG33A	SW8270D	Benzoic acid		ug/kg	U	UJ	10
A00-06-14LSD0025	12-1569-UG33A	SW8270D	Bis(2-ethylhexyl) phthalate	68	ug/kg	B	U	7
A00-06-14LSD0026	12-1570-UG33B	SW8270D	Benzoic acid		ug/kg	U	UJ	10
A00-06-14LSD0026	12-1570-UG33B	SW8270D	Bis(2-ethylhexyl) phthalate	120	ug/kg	B	U	7
A00-06-14LSD0027	12-1571-UG33C	SW8270D	Benzoic acid		ug/kg	U	UJ	10
A00-06-14LSD0027	12-1571-UG33C	SW8270D	Bis(2-ethylhexyl) phthalate	61	ug/kg	B	U	7
A00-06-14LSD0028	12-1572-UG33D	SW8270D	Benzoic acid		ug/kg	U	UJ	10
A00-06-14LSD0028	12-1572-UG33D	SW8270D	Bis(2-ethylhexyl) phthalate	31	ug/kg	B	U	7
A00-06-14LSD0029	12-1573-UG33E	SW8270D	Benzoic acid		ug/kg	U	UJ	8,10
A00-06-14LSD0029	12-1573-UG33E	SW8270D	Benzyl alcohol		ug/kg	U	R	8
A00-06-14LSD0029	12-1573-UG33E	SW8270D	Bis(2-ethylhexyl) phthalate	39	ug/kg	B	U	7
A00-06-14LSD0030	12-1574-UG33F	SW8270D	Benzoic acid		ug/kg	U	UJ	10
A00-06-14LSD0030	12-1574-UG33F	SW8270D	Bis(2-ethylhexyl) phthalate	32	ug/kg	B	U	7
A00-06-14LSD0034	12-1575-UG33G	SW8270D	Benzoic acid		ug/kg	U	UJ	8,10
A00-06-14LSD0034	12-1575-UG33G	SW8270D	Benzyl alcohol		ug/kg	U	R	8
A00-06-14LSD0035	12-1576-UG33H	SW8270D	Benzoic acid		ug/kg	U	UJ	10
A00-06-14LSD0036	12-1577-UG33I	SW8270D	Benzoic acid		ug/kg	U	UJ	10
A00-06-14LSD0036	12-1577-UG33I	SW8270D	Bis(2-ethylhexyl) phthalate	100	ug/kg	B	U	7
A00-06-14LSD0037	12-1578-UG33J	SW8270D	Benzoic acid		ug/kg	U	UJ	10
A00-06-14LSD0038	12-1579-UG33K	SW8270D	Benzoic acid		ug/kg	U	UJ	10
A00-06-14LSD0039	12-1580-UG33L	SW8270D	2,4-Dimethylphenol		ug/kg	UJ	UJ	13
A00-06-14LSD0039	12-1580-UG33L	SW8270D	2-Methylphenol		ug/kg	U	UJ	13
A00-06-14LSD0039	12-1580-UG33L	SW8270D	4-Methylphenol		ug/kg	U	UJ	13
A00-06-14LSD0039	12-1580-UG33L	SW8270D	Benzoic acid		ug/kg	U	UJ	10,13
A00-06-14LSD0039	12-1580-UG33L	SW8270D	Benzyl alcohol		ug/kg	U	UJ	13
A00-06-14LSD0039	12-1580-UG33L	SW8270D	Pentachlorophenol		ug/kg	U	UJ	13
A00-06-14LSD0039	12-1580-UG33L	SW8270D	Phenol		ug/kg	U	UJ	13
A00-06-14LSD0040	12-1581-UG33M	SW8270D	Benzoic acid		ug/kg	U	UJ	10

Qualified Data Summary Table
Slip 4 - Cap Confirmation and Boundary Sampling

Sample ID	Laboratory ID	Method	Analyte	Result	Units	Laboratory Qualifier	Validation Qualifier	Validation Reason
A00-06-14LRB0004	12-1852-UG80A	SW8270D	Hexachloroethane		ug/l	U	UJ	10
A00-06-14LWB0003	12-1853-UG80B	SW8270D	Hexachloroethane		ug/l	U	UJ	10
A00-06-14LSD0031	12-1854-UG80C	SW8270D	2,4-Dimethylphenol		ug/kg	UJ	UJ	10
A00-06-14LSD0031	12-1854-UG80C	SW8270D	Benzoic acid		ug/kg	U	UJ	10
A00-06-14LSD0031	12-1854-UG80C	SW8270D	Benzyl alcohol		ug/kg	U	UJ	10
A00-06-14LSD0032	12-1855-UG80D	SW8270D	2,4-Dimethylphenol		ug/kg	UJ	UJ	10
A00-06-14LSD0032	12-1855-UG80D	SW8270D	Benzoic acid		ug/kg	U	UJ	10
A00-06-14LSD0032	12-1855-UG80D	SW8270D	Benzyl alcohol		ug/kg	U	UJ	10
A00-06-14LSD0033	12-1856-UG80E	SW8270D	2,4-Dimethylphenol		ug/kg	UJ	UJ	8,10
A00-06-14LSD0033	12-1856-UG80E	SW8270D	Benzoic acid		ug/kg	U	UJ	8,10
A00-06-14LSD0033	12-1856-UG80E	SW8270D	Benzyl alcohol		ug/kg	U	R	8
A00-06-14LSD0033	12-1856-UG80E	SW8270D	Fluoranthene	31	ug/kg		J	9
A00-06-14LSD0033	12-1856-UG80E	SW8270D	Phenanthrene	16	ug/kg	J	J	9
A00-06-14LSD0033	12-1856-UG80E	SW8270D	Pyrene	19	ug/kg		J	9
A00-06-14LSD0041	12-1988-UH04A	SW8270D	Benzyl alcohol	210	ug/kg	Q	J	5B
A00-06-14LSD0041	12-1988-UH04A	SW8270D	Fluoranthene	3600	ug/kg	E	DNR	20
A00-06-14LSD0041	12-1988-UH04A	SW8270D	Phenanthrene	5000	ug/kg	E	DNR	20
A00-06-14LSD0041	12-1988-UH04A	SW8270D	Pyrene	2400	ug/kg	E	DNR	20
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	1,2,4-Trichlorobenzene		ug/kg	U	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	1,2-Dichlorobenzene		ug/kg	U	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	1,3-Dichlorobenzene		ug/kg	U	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	1,4-Dichlorobenzene		ug/kg	U	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	1-Methylnaphthalene	840	ug/kg		DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	2,4-Dimethylphenol		ug/kg	UJ	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	2-Methylnaphthalene	1500	ug/kg		DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	2-Methylphenol		ug/kg	U	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	4-Methylphenol		ug/kg	U	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Acenaphthene	2100	ug/kg		DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Acenaphthylene		ug/kg	U	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Anthracene	800	ug/kg		DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Benzo(a)anthracene	910	ug/kg		DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Benzo(a)pyrene	460	ug/kg		DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Benzo(g,h,i)perylene	260	ug/kg		DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Benzofluoranthenes	1100	ug/kg		DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Benzoic acid		ug/kg	U	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Benzyl alcohol	240	ug/kg	Q	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Bis(2-ethylhexyl) phthalate	670	ug/kg	B	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Butylbenzyl phthalate		ug/kg	U	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Chrysene	1100	ug/kg		DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Dibenzo(a,h)anthracene	88	ug/kg	J	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Dibenzofuran	1600	ug/kg		DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Dibutyl phthalate		ug/kg	U	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Diethyl phthalate		ug/kg	U	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Dimethyl phthalate		ug/kg	U	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Di-n-octyl phthalate	74	ug/kg	J	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Fluorene	2200	ug/kg		DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Hexachlorobenzene		ug/kg	U	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Hexachlorobutadiene		ug/kg	UJ	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Hexachloroethane		ug/kg	U	DNR	11

Qualified Data Summary Table
Slip 4 - Cap Confirmation and Boundary Sampling

Sample ID	Laboratory ID	Method	Analyte	Result	Units	Laboratory Qualifier	Validation Qualifier	Validation Reason
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Indeno(1,2,3-cd)pyrene	220	ug/kg		DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Naphthalene	2100	ug/kg		DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	N-Nitrosodiphenylamine		ug/kg	U	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Pentachlorophenol		ug/kg	U	DNR	11
A00-06-14LSD0041	12-1988-UH04ADL	SW8270D	Phenol		ug/kg	U	DNR	11
A00-06-14LSD0042	12-1989-UH04B	SW8270D	Benzyl alcohol	180	ug/kg	Q	J	5B
A00-06-14LSD0042	12-1989-UH04B	SW8270D	Phenanthrene	930	ug/kg		J	8
A00-06-14LSD0043	12-1990-UH04C	SW8270D	Benzyl alcohol	220	ug/kg	Q	J	5B
A00-06-14LSD0043	12-1990-UH04C	SW8270D	Fluoranthene	2200	ug/kg	E	DNR	20
A00-06-14LSD0043	12-1990-UH04C	SW8270D	Phenanthrene	3100	ug/kg	E	DNR	20
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	1,2,4-Trichlorobenzene		ug/kg	U	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	1,2-Dichlorobenzene		ug/kg	U	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	1,3-Dichlorobenzene		ug/kg	U	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	1,4-Dichlorobenzene		ug/kg	U	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	1-Methylnaphthalene	150	ug/kg		DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	2,4-Dimethylphenol		ug/kg	UJ	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	2-Methylnaphthalene	280	ug/kg		DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	2-Methylphenol		ug/kg	U	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	4-Methylphenol	29	ug/kg	J	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Acenaphthene	740	ug/kg		DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Acenaphthylene		ug/kg	U	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Anthracene	470	ug/kg		DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Benzo(a)anthracene	500	ug/kg		DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Benzo(a)pyrene	250	ug/kg		DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Benzo(g,h,i)perylene	150	ug/kg		DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Benzofluoranthenes	620	ug/kg		DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Benzoic acid	340	ug/kg	J	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Benzyl alcohol	220	ug/kg	Q	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Bis(2-ethylhexyl) phthalate	450	ug/kg	B	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Butylbenzyl phthalate	41	ug/kg	J	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Chrysene	600	ug/kg		DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Dibenzo(a,h)anthracene	64	ug/kg		DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Dibenzofuran	700	ug/kg		DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Dibutyl phthalate		ug/kg	U	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Diethyl phthalate		ug/kg	U	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Dimethyl phthalate		ug/kg	U	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Di-n-octyl phthalate		ug/kg	U	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Fluorene	1000	ug/kg		DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Hexachlorobenzene		ug/kg	U	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Hexachlorobutadiene		ug/kg	UJ	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Hexachloroethane		ug/kg	U	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Indeno(1,2,3-cd)pyrene	130	ug/kg		DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Naphthalene	220	ug/kg		DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	N-Nitrosodiphenylamine		ug/kg	U	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Pentachlorophenol		ug/kg	U	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Phenol	50	ug/kg	J	DNR	11
A00-06-14LSD0043	12-1990-UH04CDL	SW8270D	Pyrene	1800	ug/kg		DNR	11
A00-06-14LSD0044	12-1991-UH04D	SW8270D	Benzyl alcohol	160	ug/kg	Q	J	5B
A00-06-14LSD0045	12-1992-UH04E	SW8270D	Benzyl alcohol	200	ug/kg	Q	J	5B

Qualified Data Summary Table
Slip 4 - Cap Confirmation and Boundary Sampling

Sample ID	Laboratory ID	Method	Analyte	Result	Units	Laboratory Qualifier	Validation Qualifier	Validation Reason
A00-06-14LSD0046	12-1993-UH04F	SW8270D	Benzyl alcohol	140	ug/kg	Q	J	5B
A00-06-14LSD0047	12-1994-UH04G	SW8270D	Benzyl alcohol	190	ug/kg	Q	J	5B
A00-06-14LSD0048	12-1995-UH04H	SW8270D	Benzyl alcohol	98	ug/kg	Q	J	5B

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APPENDIX A
DATA QUALIFIER DEFINITIONS, REASON CODES, AND CRITERIA TABLES

DATA VALIDATION QUALIFIER CODES
Based on National Functional Guidelines

The following definitions provide brief explanations of the qualifiers assigned to results in the data review process.

U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents the approximate concentration.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

The following is an EcoChem qualifier that may also be assigned during the data review process:

DNR	Do not report; a more appropriate result is reported from another analysis or dilution.

DATA QUALIFIER REASON CODES

1	Holding Time/Sample Preservation
2	Chromatographic pattern in sample does not match pattern of calibration standard.
3	Compound Confirmation
4	Tentatively Identified Compound (TIC) (associated with NJ only)
5A	Calibration (initial)
5B	Calibration (continuing)
6	Field Blank Contamination
7	Lab Blank Contamination (e.g., method blank, instrument, etc.)
8	Matrix Spike(MS & MSD) Recoveries
9	Precision (all replicates)
10	Laboratory Control Sample Recoveries
11	A more appropriate result is reported (associated with “R” and “DNR” only)
12	Reference Material
13	Surrogate Spike Recoveries (a.k.a., labeled compounds & recovery standards)
14	Other (define in validation report)
15	GFAA Post Digestion Spike Recoveries
16	ICP Serial Dilution % Difference
17	ICP Interference Check Standard Recovery
18	Trip Blank Contamination
19	Internal Standard Performance (e.g., area, retention time, recovery)
20	Linear Range Exceeded
21	Potential False Positives
22	Elevated Detection Limit Due to Interference (i.e., laboratory, chemical and/or matrix)

EcoChem Validation Guidelines for Semivolatile Analysis by GC/MS
(Based on Organic NFG 1999)

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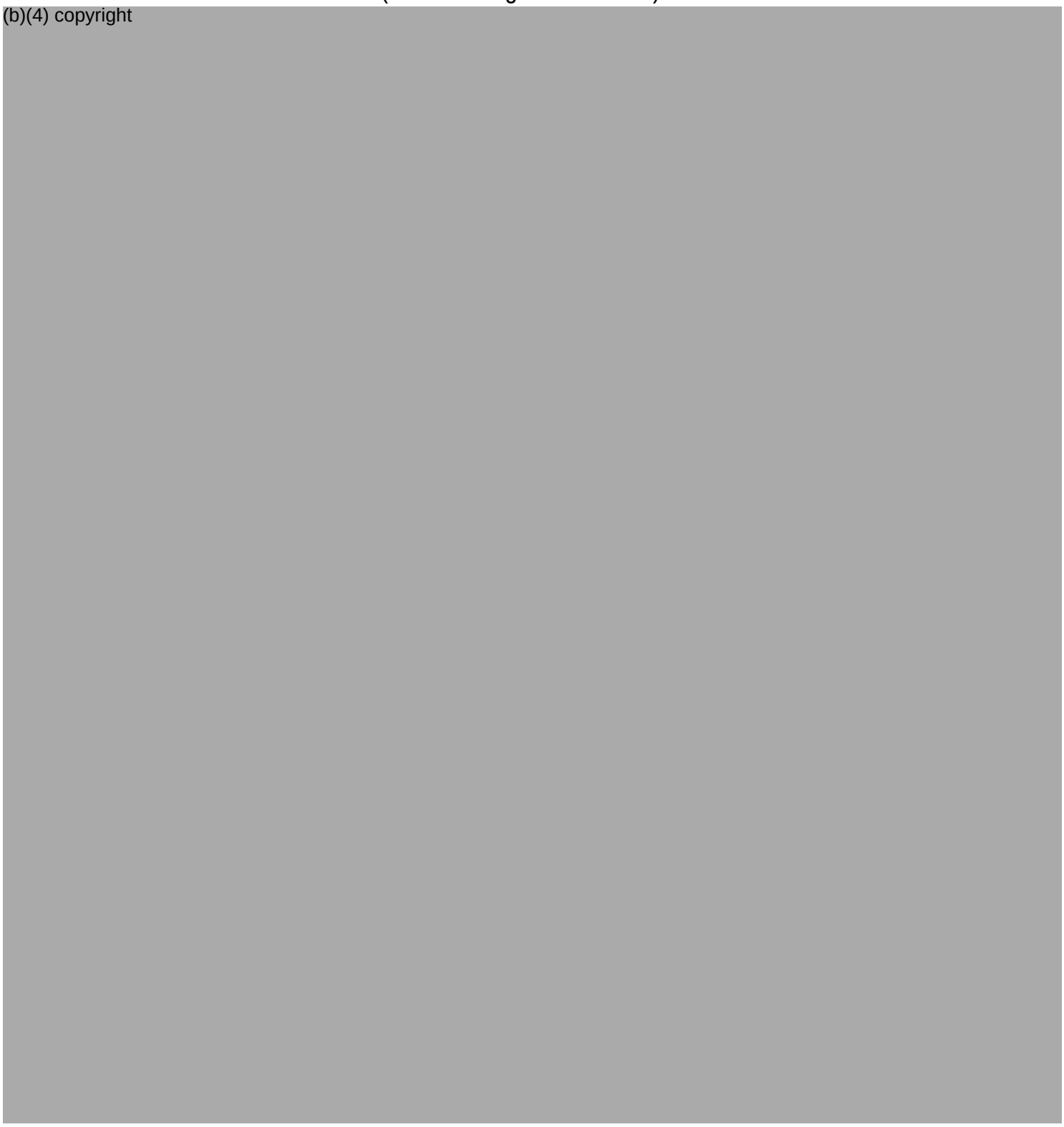

EcoChem Validation Guidelines for Semivolatile Analysis by GC/MS (Based on Organic NFG 1999)

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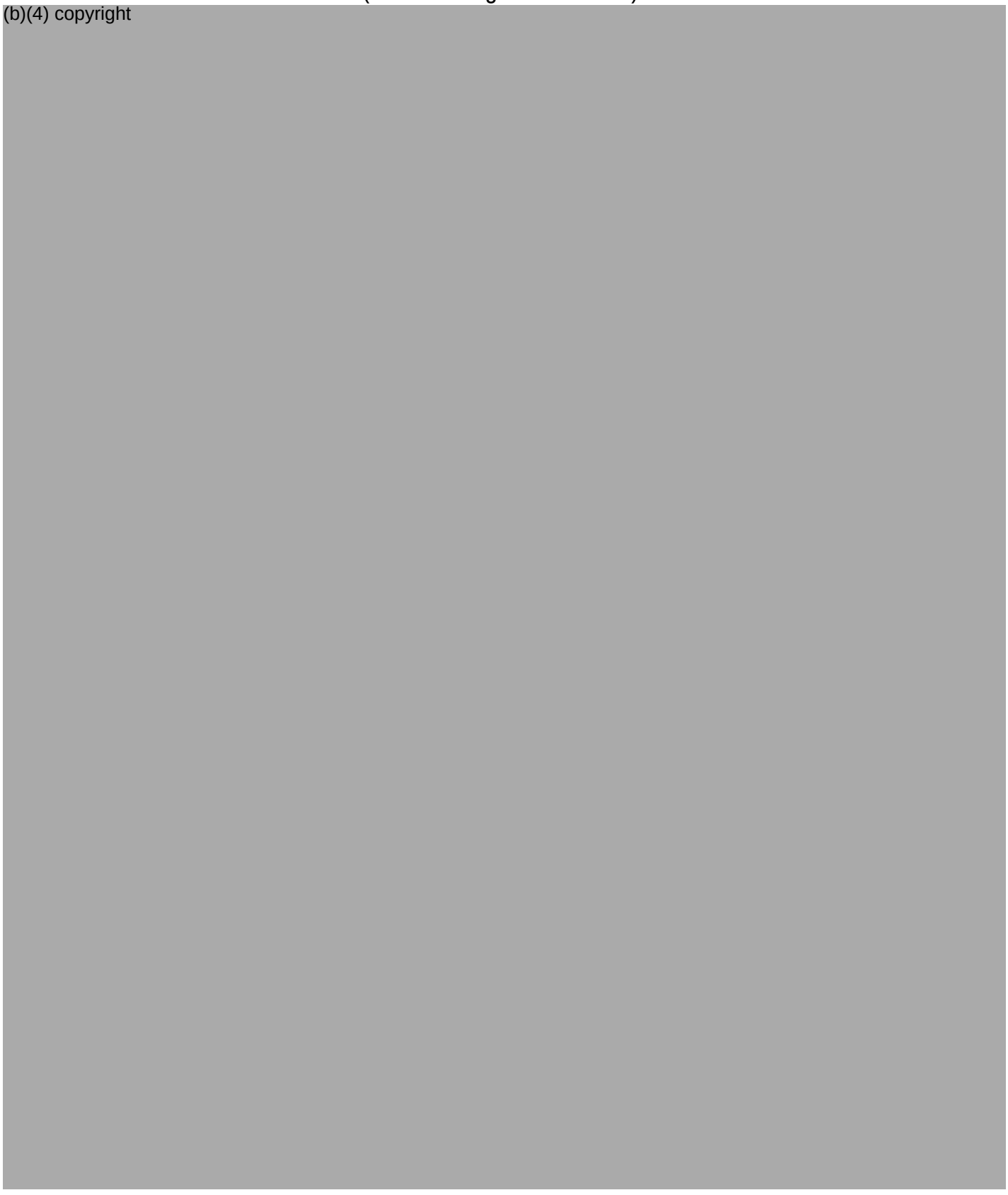

EcoChem Validation Guidelines for Pesticides, PCBs, Herbicides, and Phenol by GC/ECD
(Based on Organic NFG 1999 & EPA SW-846 Methods 8081/8082/8041/8151)

EcoChem Validation Guidelines for Pesticides, PCBs, Herbicides, and Phenol by GC/ECD (Based on Organic NFG 1999 & EPA SW-846 Methods 8081/8082/8041/8151)

EcoChem Validation Guidelines for Metals Analysis by ICP
(Based on Inorganic NFG 1994 & 2004)

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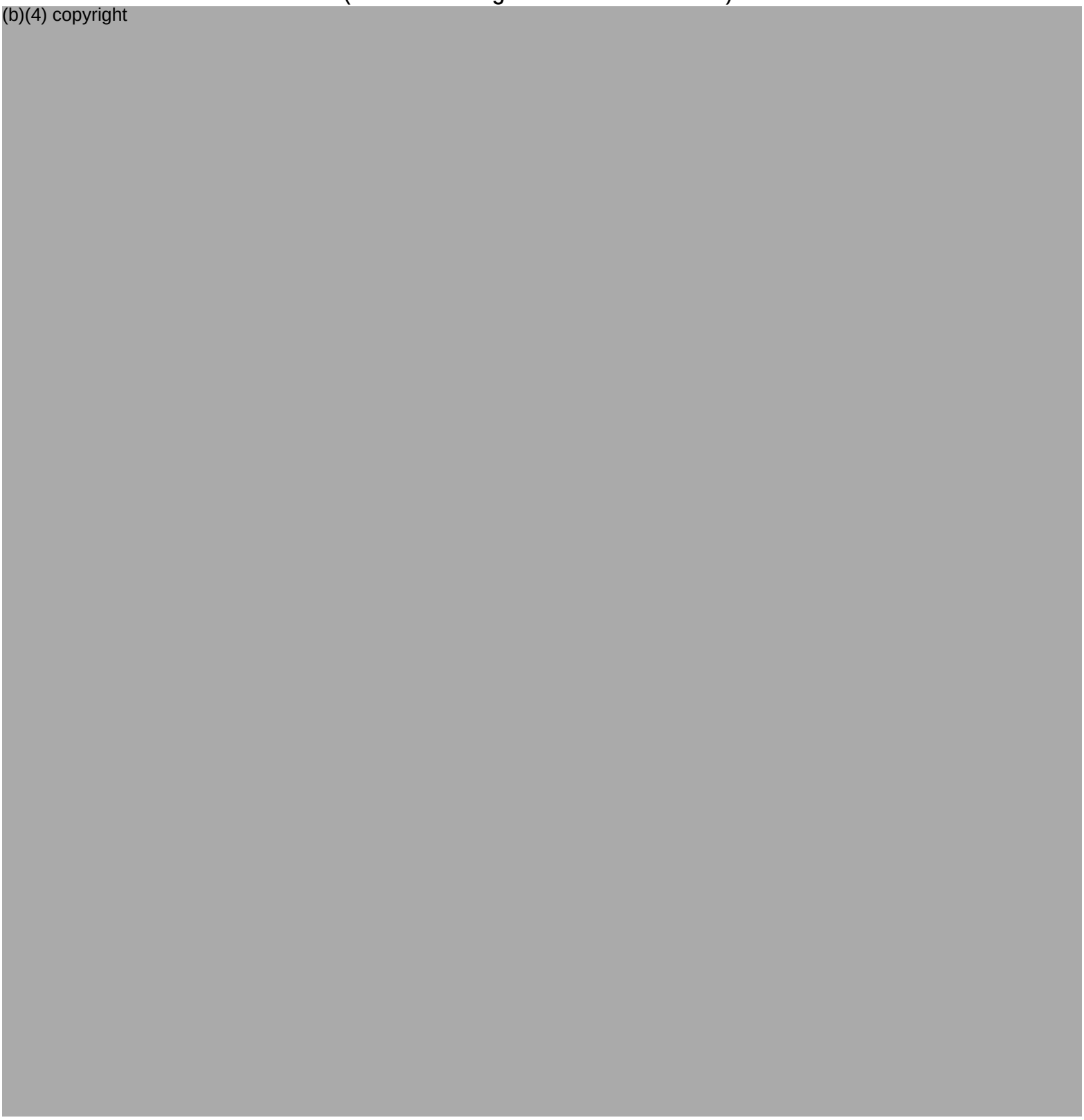
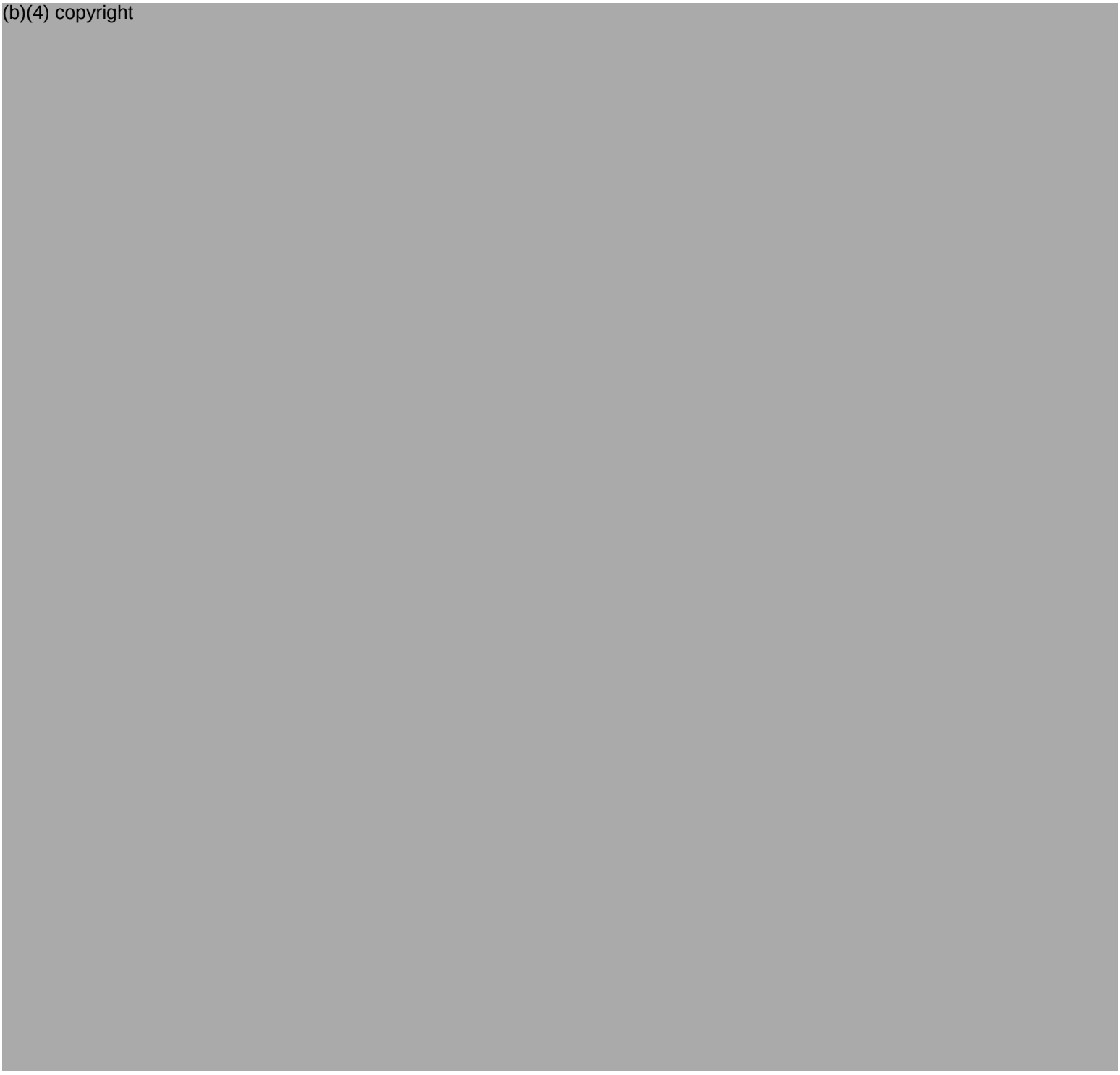


EcoChem Validation Guidelines for Metals Analysis by ICP
(Based on Inorganic NFG 1994 & 2004)

EcoChem Validation Guidelines for Metals Analysis by ICP-MS
(Based on Inorganic NFG 1994 & 2004)



EcoChem Validation Guidelines for Metals Analysis by ICP-MS
(Based on Inorganic NFG 1994 & 2004)

EcoChem Validation Guidelines for Mercury Analysis by CVAA
(Based on Inorganic NFG 1994 & 2004)

EcoChem Validation Guidelines for Mercury Analysis by CVAA
(Based on Inorganic NFG 1994 & 2004)

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EcoChem Validation Guidelines for Conventional Chemistry Analysis (Based on EPA Standard Methods)

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APPENDIX B
DATA VALIDATION REPORTS

DATA VALIDATION REPORT
Slip 4 Early Action Area –Cap Confirmation and Boundary Sampling
Semivolatile Organic Compounds by Method SW8270D

This report documents the review of analytical data from the analysis of sediment samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington.

SDG	Number of Samples	Validation Level
UG33	13 Sediment	EPA Stage 4
	1 Rinsate Blank	EPA Stage 2A
UG80	3 Sediment	EPA Stage 4
	1 Rinsate Blank, 1 Field Blank	EPA Stage 2A
UH04	8 Sediment	EPA Stage 4

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed in the following table.

	Sample Receipt, Preservation, and Holding Times	2	Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
	GC/MS Instrument Performance Check	1	Field Replicates
	Initial Calibration (ICAL)		Internal Standards
2	Continuing Calibration (CCAL)		Target Analyte List
2	Laboratory Blanks	1	Compound Identification
1	Field Blanks	2	Reported Results
2	Surrogate Compounds	1	Calculation Verification (Full validation only)
2	Laboratory Control Samples (LCS/LCSD)		

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Continuing Calibration

SDG UG33: The continuing calibration (CCAL) percent difference (%D) value for benzyl alcohol was greater than the control limit of 25% and indicated an increase in instrument response. This compound was not detected in any of the associated samples; no action was necessary.

SDG UH04: The CCAL %D value for benzyl alcohol was greater than the control limit of 25% and indicated an increase in instrument response. Positive results for this compound were estimated (J-5B) to indicate a potential high bias.

Laboratory Blanks

SDG UG33: Bis(2-ethylhexyl)phthalate was detected in the method blank associated with the sediment samples. In order to evaluate the effect on the associated samples, an action level was established at 10 times the blank concentration as this compound is a common laboratory contaminant. All positive results for bis(2-ethylhexyl)phthalate were qualified as not-detected (U-7).

SDG UH04: Bis(2-ethylhexyl)phthalate was detected in the method blank. All results for this compound were greater than the action level; no qualification of data was necessary.

Field Blanks

SDG UG33: One equipment rinsate blank (RB0005) was submitted. No target analytes were detected in this field blank.

SDG UG80: One equipment rinsate blank (RB0004) and one DI water blank (WB0003) were submitted. No target analytes were detected in these field blanks.

Surrogate Compounds

SDG UG33: The percent recovery (%R) values for the acid fraction surrogates 2-fluorophenol and 2,4,6-tribromophenol were less than the lower control limit of 50% in Sample SD0039. There were no positive results for the acid fraction analytes; reporting limits were estimated (UJ-13) to indicate a potential low bias.

SDG UG80: The %R value for the acid fraction surrogate 2,4,6-tribromophenol was less than the lower control limit of 50% in Sample SD0033. One outlier per acid or base/neutral fraction is allowed; therefore no action was taken for this single outlier.

Laboratory Control Samples

SDG UG33: The %R value for benzoic acid was less than the lower control limit in the laboratory control sample (LCS) associated with the sediment samples. Benzoic acid was not

detected in the associated samples; reporting limits were estimated (UJ-10) to indicate a potential low bias.

The LCS %R value for hexachloroethane was less than the lower control limit in the laboratory control sample associated with the field blank. The laboratory control sample duplicate (LCSD) recovery was acceptable; therefore no action was taken.

SDG UG80: The %R values for hexachloroethane were less than the lower control limit in the LCS/LCSD associated with the field blanks. Hexachloroethane was not detected in these samples; reporting limits were estimated (UJ-10) to indicate a potential low bias. The LCS %R values for 1,3-dichlorobenzene and hexachlorobutadiene were also less than the lower control limit. The LCSD %R values were acceptable; therefore no action was taken.

The %R values for benzoic acid, benzyl alcohol, and 2,4-dimethylphenol were less than the lower control limit in the LCS associated with the sediment samples. These analytes were not detected in the associated samples; reporting limits were estimated (UJ-10) to indicate a potential low bias.

Matrix Spike/Matrix Spike Duplicate

SDG UG33: Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed using Samples SD0029 and SD0034. Benzyl alcohol was not recovered in either set of MS/MSD analyses. Benzyl alcohol was not detected in either parent sample; results for this compound were rejected (R-8) in both samples.

For the MS/MSD analyses using Sample SD0029, the %R values for benzoic acid were less than the lower control limit; the reporting limit for this analyte in the parent sample was estimated (UJ-8) to indicate a potential low bias. The MS %R value for benzoic acid in the MS/MSD analyses using Sample SD0034 was less than the lower control limit; no action was taken for this single outlier.

SDG UG80: The MS/MSD analyses were performed using Sample SD0033. Benzyl alcohol was not recovered; the reporting limit for benzyl alcohol was rejected (R-8) in the parent sample. The %R values for benzoic acid and 2,4-dimethylphenol were less than the lower control limit; reporting limits for these analytes were estimated (UJ-8) in the parent sample. The MSD %R values for fluoranthene, phenanthrene, and pyrene were greater than the upper control limit. The MS %R values were acceptable; no data were qualified for these single outliers.

The relative percent difference (RPD) values for fluoranthene, phenanthrene, and pyrene were greater than the control limit; results for these analytes were estimated (J-9).

SDG UH04: The MS/MSD analyses were performed using Sample SD0042. The %R values for phenanthrene were greater than the upper control limit; the result for this analyte was estimated (J-8) in the parent sample. The MS %R value for benzoic acid was less than the lower control limit and the MS %R value for fluoranthene was greater than the upper control limit; no data were qualified for these single outliers.

Field Replicates

The relative percent difference (RPD) value control limit is 50% for results greater than five times the reporting limit (RL). For results less than five times the RL, the difference between the sample and replicate must be less than two times the RL.

SDG UG33: Samples SD0029 & SD0030 and SD0034 & SD0035 were identified as field replicates. All field precision criteria were met.

Compound Identification

SDG UH04: The N-nitrosodiphenylamine result in Samples SD0041 and SD0043 were "M" flagged by the laboratory to indicate that the analyte was detected and confirmed, but with low spectral match. The spectra were reviewed and were found to be acceptable. No qualifiers were required.

Reported Results

SDG UH04: The results for fluoranthene, phenanthrene, and pyrene in Sample SD0041 and fluoranthene and phenanthrene in Sample SD0043 were flagged "E" by the laboratory to indicate that the calibration range was exceeded. These samples were diluted and reanalyzed. Both sets of results were reported. The results flagged "E" were flagged do-not-report (DNR-20); the results from the dilutions should be used instead. The results for all other analytes in the dilutions were flagged (DNR-11).

Calculation Verification

Several results were verified by recalculation from the raw data. No calculation or transcription errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. With the exceptions noted above, accuracy was acceptable as demonstrated by the surrogate, LCS/LCSD, and MS/MSD recoveries and precision was acceptable as demonstrated by the MS/MSD, LCS/LCSD, and field replicate RPD values.

Detection limits were elevated based on method blank contamination. Results were estimated based on surrogate %R, MS/MSD %R, LCS %R, and MS/MSD RPD outliers.

Data were rejected because the analyte was not recovered in the MS/MSD. Data were flagged do-not-report (DNR) to indicate which result, from multiple analyses, should not be used.

Data that has been rejected or flagged DNR should not be used for any purpose. All other data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Slip 4 Early Action Area – Cap Confirmation and Boundary Sampling
PCB Aroclors by Method SW8082

This report documents the review of analytical data from the analysis of sediment samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington.

SDG	Number of Samples	Validation Level
UG33	13 Sediment	EPA Stage 4
	1 Rinsate Blank	EPA Stage 2A
UG80	3 Sediment	EPA Stage 4
	1 Rinsate Blank, 1 Field Blank	EPA Stage 2A
UH04	8 Sediment	EPA Stage 4

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%). No errors were found.

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed in the following table

	Sample Receipt, Preservation, and Holding Times	1	Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
	Initial Calibration (ICAL)	1	Field Replicates
	Continuing Calibration (CCAL)		Internal Standards
	Laboratory Blanks	2	Reporting Limits
1	Field Blanks		Compound Identification
	Surrogate Compounds		Reported Results
	Laboratory Control Samples (LCS/LCSD)	1	Calculation Verification (Full Validation only)

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Field Blanks

SDG UG33: One equipment rinsate blank (RB0005) was submitted. No target analytes were detected in this field blank.

SDG UG80: One equipment rinsate blank (RB0004) and one DI water blank (WB0003) were submitted. No target analytes were detected in these field blanks.

Matrix Spike/Matrix Spike Duplicate

SDG UH04: Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed using Sample SD0042. The percent recovery (%R) values for Aroclor 1016 were greater than the upper control limit, at 169% and 182%. Aroclor 1016 was not detected in the parent sample; no qualification was necessary based on the potential high bias.

Field Replicates

The relative percent difference (RPD) value control limit is 50% for results greater than five times the reporting limit (RL). For results less than five times the RL, the difference between the sample and replicate must be less than two times the RL.

SDG UG33: Samples SD0029 & SD0030 and SD0034 & SD0035 were identified as field replicates. There were no target analytes detected in samples SD0034 & SD0035. All field precision criteria were met for samples SD0029 & SD0030.

Reporting Limits

SDG UG33: The result for Aroclor 1248 in Sample SD0030 was flagged "Y" by the laboratory due to the presence of non-target background interferences. This "Y" flagged result was qualified as not-detected (U-22) to indicate that the reported value represents an elevated detection limit.

SDG UG80: The results for Aroclor 1248 in Samples SD0031 and SD0031 were flagged "Y". These results were qualified as not-detected (U-22).

SDG UH04: All samples in this SDG were analyzed at dilution (5x) due to matrix interference and/or high levels of Aroclors. Reporting limits were elevated accordingly.

Calculation Verification

Several results were verified by recalculation from the raw data. No calculation or transcription errors were noted.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory performed the specified analytical method. With the exceptions noted above, accuracy was acceptable as demonstrated by the surrogate, MS/MSD, and laboratory control sample (LCS/LCSD) percent recovery values. Precision was acceptable as demonstrated by the MS/MSD, LCS/LCSD, and field replicate RPD values.

Detection limits were elevated due to matrix interferences.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Slip 4 Early Action Area – Cap Confirmation and Boundary Sampling
Metals by EPA Methods 6010B, 7470A, & 7471A

This report documents the review of analytical data from the analyses of sediment samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington.

SDG	Number of Samples	Validation Level
UG33	13 Sediment	EPA Stage 4
	1 Rinsate Blank	EPA Stage 2A
UG80	3 Sediment	EPA Stage 4
	1 Rinsate Blank, 1 Field Blank	EPA Stage 2A
UH04	8 Sediment	EPA Stage 4

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

	Sample Receipt, Preservation, and Holding Times		Laboratory Duplicates
	Initial Calibration	1	Field Replicates
	Continuing Calibration Verification		Interference Check Samples
	CRDL Standards		Serial Dilutions
	Laboratory Blanks		ICP-MS Internal Standards
1	Field Blanks		Reporting Limits (MDL and MRL)
	Laboratory Control Samples (LCS)	1	Calculation Verification (Full validation only)
2	Matrix Spikes		

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Field Blanks

SDG UG33: One equipment rinsate blank (RB0005) was submitted. No target analytes were detected in the blank.

SDG UG80: One equipment rinsate blank (RB0004) and one DI water blank (WB0003) were submitted. No target analytes were detected in these field blanks.

Matrix Spikes

SDG UH04: The matrix spike (MS) analysis was performed using Sample SD0041. The percent recovery (%R) value for zinc was less than the lower control limit of 75%. All associated zinc results were estimated (J-8) to indicate a potential low bias.

The %R value for mercury was greater than the upper control limit of 125%. All associated mercury results were estimated (J-8) to indicate a potential high bias.

Field Replicates

The relative percent difference (RPD) value control limit is 35% for results greater than five times the reporting limit (RL). For results less than five times the RL, the difference between the sample and replicate must be less than two times the RL.

Although no qualification of results is required based on RPD outliers, data users should take field precision into account when interpreting sample data.

SDG UG33: Samples SD0029 and SD0030 were identified as field replicates. The RPD for chromium (74%) exceeded the control limit.

Samples SD0034 and SD0035 were also identified as field replicates. All field precision criteria were met.

Calculation Verification

Several results were verified by recalculation from the raw data. No calculation or transcription errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical methods. With the exceptions noted above, accuracy was acceptable as demonstrated by the laboratory control sample and matrix spike percent recovery values and precision was acceptable as demonstrated by the laboratory duplicate and field replicate RPD values.

Data were estimated based on matrix spike recovery outliers.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Slip 4 Early Action Area – Cap Confirmation and Boundary Sampling
Conventional Chemistry Analyses

This report documents the review of analytical data from the analysis of sediment samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington.

SDG	Number of Samples	Validation Level
UG33	13 Sediment	EPA Stage 4
	1 Rinsate Blank	EPA Stage 2A
UG80	3 Sediment	EPA Stage 4
	1 Rinsate Blank, 1 Field Blank	EPA Stage 2A
UH04	8 Sediment	EPA Stage 4

The analytical tests that were performed are summarized below.

Parameter	Method
Total Organic Carbon (TOC)	Plumb, 1981 and EPA 415.1
Total Solids	EPA 160.3M

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed in the following table.

	Sample Receipt, Preservation, and Holding Times		Matrix Spikes (MS)
	Initial Calibration		Laboratory Replicates
	Calibration Verification	1	Field Replicates
	Laboratory Blanks		Reported Results
1	Field Blanks		Reporting Limits
	Laboratory Control Samples (LCS)	1	Calculation Verification (Full validation only)
1	Reference Materials		

[1] ***Quality control results are discussed below, but no data were qualified.***

Field Blanks

SDG UG33: One equipment rinsate blank (RB0005) was submitted. Total organic carbon (TOC) was not detected in the blank.

SDG UG80: One equipment rinsate blank (RB0004) and one DI water blank (WB0003) were submitted. TOC was not detected in these field blanks.

Reference Materials

The standard reference material (SRM) ERA 053-11-05 was analyzed with the blank (water) samples for total organic carbon (TOC). The reference material NIST 1941B was analyzed with the sediment samples for TOC. All recoveries were within the certified acceptance ranges for all SDGs.

Field Replicates

The relative percent difference (RPD) value control limit is 30% for results greater than five times the reporting limit (RL). For results less than five times the RL, the difference between the sample and duplicate must be less than two times the RL.

Although no qualification of results is required based on RPD outliers, data users should take field precision into account when interpreting sample data.

SDG UG33: Samples SD0029 and SD0030 were identified as field replicates. The RPD for TOC (67%) exceeded the control limit.

Samples SD0034 and SD0035 were also identified as field replicates. The RPD for TOC (50%) exceeded the control limit.

Calculation Verification

Several results were verified by recalculation from the raw data. No calculation or transcription errors were found.

IV. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical methods. Accuracy was acceptable as demonstrated by the matrix spike sample and laboratory control sample percent recovery values. With the exceptions noted above, precision was acceptable as demonstrated by the laboratory and field replicate RPD values.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

EcoChem, INC.
Environmental Data Quality

DATA QUALITY EVALUATION

SLIP 4 EARLY ACTION AREA

Boundary Area Sediment Sampling

Prepared for:

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Integral Project: A0006-14L-ECI-01

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EcoChem Project: C22129-8

March 15, 2012

Approved for Release:

Christine Ransom
Project Manager
EcoChem, Inc.

DATA QUALITY EVALUATION

BASIS OF DATA EVALUATION

The data were validated using guidance and quality control (QC) criteria documented in the analytical methods; *Lower Duwamish Waterway, Slip 4 Early Action Area, 100% Design Submittal Construction Quality Assurance Plan* (Integral Aug. 30, 2010); *Guidance on Environmental Data Verification and Validation* (EPA 2002); and *National Functional Guidelines for Organic Data Review* (USEPA 1999 & 2005).

The samples for this sampling event were analyzed for the following:

Analysis	Method
Polychlorinated Biphenyl (PCB) Aroclors	SW8082
Total Organic Carbon, Total Solids	Plumb 1981, E415.1, E160.3M

Data qualifier definitions, reason codes, and validation criteria are included as **Appendix A**. Data validation reports, which discuss individual findings for each quality control element, are provided in **Appendix B**. Data validation worksheets and communication records will be kept on file at EcoChem.

PROCESS FOR DATA VALIDATION

All electronic data deliverable files (EDD) were verified by comparing 100% of the field sample results and 10% of the QC sample results to the hardcopy data package. All (100%) of the sediment data received a full (EPA Stage 4) validation, which included evaluation (as appropriate for each method) of the items listed below. Rinsate blanks received a compliance level review (EPA Stage 2A):

- Package completeness
- Sample chain-of-custody and sample preservation
- Analytical holding times
- Blank contamination
- Precision (replicate analyses)
- Accuracy (compound recovery)
- Chromatogram review
- Detection limits and target analyte list
- Instrument performance (initial calibration, continuing calibration, tuning, sensitivity and degradation)
- Compound Identification
- Transcription checks
- Calculation checks

A dual-tier system of primary and secondary reviewers is utilized to ensure technical correctness and QC of the validation process; and all data validation is documented using standardized and

controlled validation worksheets and spreadsheets. These worksheets are completed for each SDG, documenting all deficiencies, outliers and subsequent qualifiers.

After qualifiers are entered into the EcoChem database, a second party verifies 100% of the qualifier entry. Interpretive qualifiers are then applied to the field samples and qualified data is exported to the project database (Integral).

SUMMARY OF DATA VALIDATION: POLYCHLORINATED BIPHENYLS (PCB)

A total of 9 sediment samples, two rinsate blanks, and one DI blank were analyzed for polychlorinated biphenyl compounds (PCB Aroclors) for the Slip 4 Boundary Area Sediment Sampling. Analytical Resources, Inc., Tukwila, Washington performed the PCB Aroclor analyses.

The Aroclor data was generally acceptable. No data were rejected for any reason. A total of 4 data points (12.4% of all PCB sediment results) were qualified as not detected at an elevated reporting limit due to matrix interferences. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the quality control (QC) procedures used during the analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the PCB analyses.

Holding Times and Sample Preservation

All sample preservation and holding time criteria were met.

Instrument Performance

Calibrations

Initial and continuing calibrations were completed for all reported analytes at the proper frequency. All initial and continuing calibrations met all acceptance criteria.

Method Blank Analyses

Method blanks were analyzed at the appropriate frequency. No target analytes were detected in any method blank.

Accuracy

Surrogate Compound Recovery

Surrogate compounds were added to all samples. The recovery values for all surrogates were within control limits.

Matrix Spike Recovery

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at the proper frequency. The recoveries for both spiked Aroclors (1016 and 1260) were within the QAPP specified acceptance criteria.

Laboratory Control Sample Recovery

Laboratory control sample (LCS) analyses met the criteria for frequency of analysis. All LCS recovery values were acceptable.

Precision

The MS/MSD analyses were evaluated for laboratory precision. The relative percent difference (RPD) values reported by the laboratory met the criteria for acceptable performance.

Target Analyte List

No target analyte list was specified. The same seven Aroclors were reported for all field samples.

Compound Identification

The results from the two analytical columns were compared for agreement. All RPD values between the two columns met the acceptance criteria.

Reported Results

Due to the presence of non-target background interferences, several results were flagged "Y" by the laboratory. These "Y" flagged results were qualified as not-detected (U) to indicate that the reported values represent elevated detection limits.

Field Quality Control Samples

Two rinsate blanks, RB0006 and RB0007, and one DI blank, WB0004, were submitted. No target analytes were detected in the field blanks.

One set of field replicates were submitted: SD0049 and SD0050. All precision criteria were met.

SUMMARY OF DATA VALIDATION: TOTAL ORGANIC CARBON (TOC) AND TOTAL SOLIDS

A total of 9 sediment samples were analyzed for TOC and total solids for the Slip 4 Boundary Area Sediment Sampling. Two rinsate blanks and one DI blank were also analyzed for TOC. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington.

The TOC and total solids data for the samples were generally acceptable. No data were rejected or qualified for any reason.

The laboratory data were evaluated in terms of completeness, holding times, accuracy, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the conventional parameters analyses.

Holding Times and Sample Preservation

All sample preservation and holding time criteria were met.

Accuracy

Matrix Spike Recovery

The matrix spike (MS) analysis for TOC met the criteria for frequency of analysis and recovery.

Laboratory Control Sample Recovery

The LCS analysis for TOC met the criteria for frequency of analysis. The recovery value reported by the laboratory met the criteria for acceptable performance.

Precision

Laboratory replicate analyses (duplicate and triplicate) were evaluated for laboratory precision. Precision was acceptable in all laboratory replicate analyses.

Field Quality Control Samples

Two rinsate blanks, RB0006 and RB0007, and one DI blank, WB0004, were submitted. No target analytes were detected in the field blanks.

One set of field replicates were submitted: SD0049 and SD0050. All precision criteria were met.

Sample Index
Slip 4 - Boundary Area Sampling

Sample ID	Laboratory ID	PCB	TOC	TS
A00-06-14LSD0049	12-2628-UI20A	✓	✓	✓
A00-06-14LSD0050	12-2629-UI20B	✓	✓	✓
A00-06-14LSD0051	12-2630-UI20C	✓	✓	✓
A00-06-14LSD0052	12-2631-UI20D	✓	✓	✓
A00-06-14LSD0053	12-2632-UI20E	✓	✓	✓
A00-06-14LSD0054	12-2633-UI20F	✓	✓	✓
A00-06-14LSD0055	12-2634-UI20G	✓	✓	✓
A00-06-14LSD0056	12-2635-UI20H	✓	✓	✓
A00-06-14LSD0057	12-2636-UI20I	✓	✓	✓
A00-06-14LRB0006	12-2637-UI20J	✓	✓	
A00-06-14LRB0007	12-2638-UI20K	✓	✓	
A00-06-14LWB0004	12-2639-UI20L	✓	✓	

Qualified Data Summary Table
Slip 4 - Boundary Area Sampling

Sample ID	Laboratory ID	Method	Analyte	Result	Units	Laboratory Qualifier	Validation Qualifier	Validation Reason
A00-06-14LSD0049	12-2628-UI20A	SW8082	Aroclor 1221		ug/kg	Y	U	22
A00-06-14LSD0050	12-2629-UI20B	SW8082	Aroclor 1221		ug/kg	Y	U	22
A00-06-14LSD0054	12-2633-UI20F	SW8082	Aroclor 1221		ug/kg	Y	U	22
A00-06-14LSD0056	12-2635-UI20H	SW8082	Aroclor 1221		ug/kg	Y	U	22

EcoChem, INC.
Environmental Data Quality

APPENDIX A
DATA QUALIFIER DEFINITIONS, REASON CODES, AND CRITERIA TABLES

DATA VALIDATION QUALIFIER CODES
Based on National Functional Guidelines

The following definitions provide brief explanations of the qualifiers assigned to results in the data review process.

U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents the approximate concentration.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

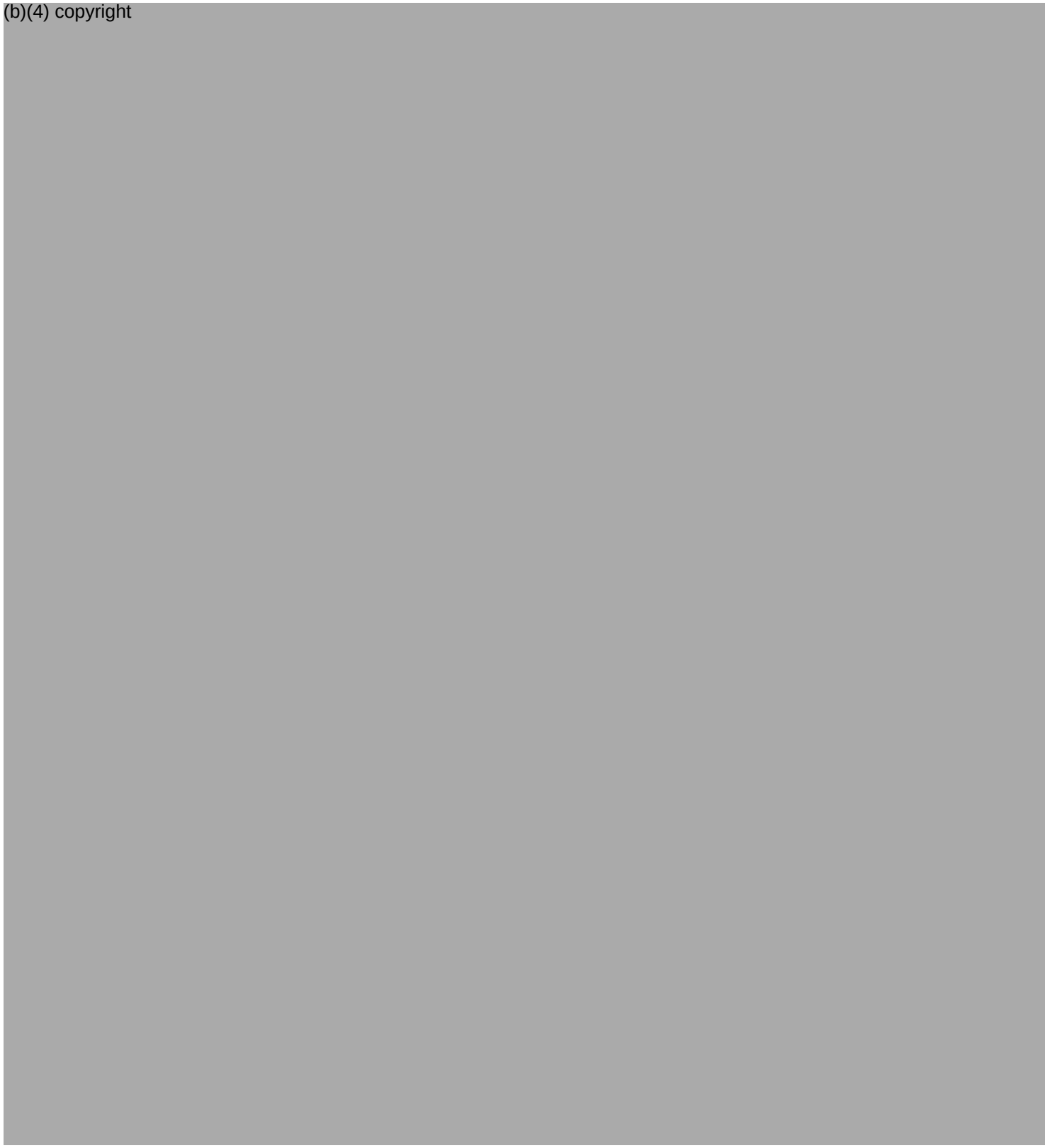
The following is an EcoChem qualifier that may also be assigned during the data review process:

DNR	Do not report; a more appropriate result is reported from another analysis or dilution.

DATA QUALIFIER REASON CODES

1	Holding Time/Sample Preservation
2	Chromatographic pattern in sample does not match pattern of calibration standard.
3	Compound Confirmation
4	Tentatively Identified Compound (TIC) (associated with NJ only)
5A	Calibration (initial)
5B	Calibration (continuing)
6	Field Blank Contamination
7	Lab Blank Contamination (e.g., method blank, instrument, etc.)
8	Matrix Spike(MS & MSD) Recoveries
9	Precision (all replicates)
10	Laboratory Control Sample Recoveries
11	A more appropriate result is reported (associated with “R” and “DNR” only)
12	Reference Material
13	Surrogate Spike Recoveries (a.k.a., labeled compounds & recovery standards)
14	Other (define in validation report)
15	GFAA Post Digestion Spike Recoveries
16	ICP Serial Dilution % Difference
17	ICP Interference Check Standard Recovery
18	Trip Blank Contamination
19	Internal Standard Performance (e.g., area, retention time, recovery)
20	Linear Range Exceeded
21	Potential False Positives
22	Elevated Detection Limit Due to Interference (i.e., laboratory, chemical and/or matrix)

EcoChem Validation Guidelines for Pesticides, PCBs, Herbicides, and Phenol by GC/ECD (Based on Organic NFG 1999 & EPA SW-846 Methods 8081/8082/8041/8151)



EcoChem Validation Guidelines for Pesticides, PCBs, Herbicides, and Phenol by GC/ECD
(Based on Organic NFG 1999 & EPA SW-846 Methods 8081/8082/8041/8151)

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Environmental Data Quality

APPENDIX B
DATA VALIDATION REPORTS

DATA VALIDATION REPORT
Slip 4 Early Action Area – Boundary Area Sampling
PCB Aroclors by Method SW8082

This report documents the review of analytical data from the analysis of sediment samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington.

SDG	Number of Samples	Validation Level
UI20	9 Sediment	EPA Stage 4
	3 Field Blank	EPA Stage 2A

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%). No errors were found.

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed in the following table

1	Sample Receipt, Preservation, and Holding Times		Matrix Spikes/Matrix Spike Duplicate (MS/MSD)
	Initial Calibration (ICAL)	1	Field Replicates
	Continuing Calibration (CCAL)		Internal Standards
	Laboratory Blanks		Reporting Limits
1	Field Blanks		Compound Identification
	Surrogate Compounds	2	Reported Results
	Laboratory Control Samples (LCS/LCSD)	1	Calculation Verification (Full Validation only)

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Sample Receipt, Preservation, and Holding Times

One of two coolers was received at the laboratory with a temperature outside the recommended temperature range of 4°C ± 2°C. The temperature outlier (1.9°C) did not impact data quality; therefore no data were qualified.

Field Blanks

Two equipment rinsate blanks, RB0006 and RB0007, and one DI water blank, WB0004, were submitted. No target analytes were detected in these field blanks.

Field Replicates

The relative percent difference (RPD) value control limit is 50% for results greater than five times the reporting limit (RL). For results less than five times the RL, the difference between the sample and replicate must be less than two times the RL.

Samples SD0049 and SD0050 were identified as field replicates. No target analytes were detected in the parent sample or duplicate. All field precision criteria were met.

Reporting Limits

The Aroclor 1221 results for Samples SD0049, SD0050, SD0054, and SD0056 were flagged "Y" by the laboratory due to the presence of non-target background interference. These "Y" flagged results were qualified as not-detected (U-22) to indicate that the reported value represents an elevated detection limit.

Calculation Verification

Several results were verified by recalculation from the raw data. No calculation or transcription errors were noted.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory performed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, matrix spike/matrix spike duplicate (MS/MSD), and laboratory control sample (LCS/LCSD) percent recovery values. Precision was acceptable as demonstrated by the RPD values for the MS/MSD, LCS/LCSD, and field duplicate analyses.

The Aroclor 1221 detection limits were elevated in four samples due to matrix interferences.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Slip 4 Early Action Area Sediment Sampling
Conventional Chemistry Analyses

This report documents the review of analytical data from the analysis of sediment samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington.

SDG	Number of Samples	Validation Level
UI20	9 Sediment	EPA Stage 4
	3 Field Blank	EPA Stage 2A

The analytical tests that were performed are summarized below.

Parameter	Method
Total Organic Carbon (TOC)	Plumb, 1981 and EPA 415.1
Total Solids	EPA 160.3M

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed in the following table.

1	Sample Receipt, Preservation, and Holding Times		Matrix Spikes (MS)
	Initial Calibration		Laboratory Replicates
	Calibration Verification	1	Field Replicates
	Laboratory Blanks		Reported Results
1	Field Blanks		Reporting Limits
	Laboratory Control Samples (LCS)	1	Calculation Verification
1	Reference Materials		

[1] ***Quality control results are discussed below, but no data were qualified.***

Sample Receipt, Preservation, and Holding Times

One of two coolers was received at the laboratory with a temperature outside the recommended temperature range of 4°C ± 2°C. The temperature outlier (1.9°C) did not impact data quality; therefore no data were qualified.

Field Blanks

Two equipment rinsate blanks, RB0006 and RB0007, and one DI water blank, WB0004, were submitted. Total organic carbon (TOC) was not detected in these field blanks.

Reference Materials

The standard reference material (SRM) ERA 053-11-05 was analyzed with the blank (water) samples for total organic carbon (TOC). The reference material NIST 1941B was analyzed with the sediment samples for TOC. All recoveries were within the certified acceptance ranges.

Field Replicates

The relative percent difference (RPD) value control limit is 30% for results greater than five times the reporting limit (RL). For results less than five times the RL, the difference between the sample and replicate must be less than two times the RL.

Samples SD0049 and SD0050 were identified as field duplicates. All field precision criteria were met.

Calculation Verification

Several results were verified by recalculation from the raw data. No calculation or transcription errors were found.

IV. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical methods. Accuracy was acceptable as demonstrated by the matrix spike sample and laboratory control sample percent recovery values. Precision was acceptable as demonstrated by the laboratory and field replicate RPD values.

No data were qualified for any reason.

All data, as reported, are acceptable for use.